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(FILE 'HOME' ENTERED AT 09:46:05 ON 04 AUG 2004)
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FILE 'HCAPLUS' ENTERED AT 09:46:16 ON 04 AUG 2004

L1 1 S (US20020173024 OR US20020172951)/PN OR (WO2001-US18532 OR US2
 E HORWATH K/AU

L2 14 S E3-E6
 E EASTON C/AU

L3 15 S E3,E14,E17

L4 26 S L2,L3

L5 197 S THERMAL (L) HYSTERESIS (L) ?PROTEIN?

L6 41 S THERMAL (L) HYSTERESIS (L) ?PEPTIDE?

L7 1071 S ANTIFREEZ? (L) ?PROTEIN?

L8 332 S ANTIFREEZ? (L) ?PEPTIDE?
 E THP

L9 5105 S E3
 E AFP

L10 3573 S E3

L11 30 S L9 AND THERMAL (L) HYSTERESIS

L12 350 S L10 AND ANTIFREEZ?

L13 1177 S L5-L8,L11,L12
 E HYSTERESIS/CT
 E E3+ALL

L14 272 S E1 (L) THERMAL

L15 31 S L14 AND (?PROTEIN? OR ?PEPTIDE?)

L16 1177 S L13,L15
 E ANTIFREEZE/CT
 E E5+ALL

L17 667 S E2

L18 1177 S L16,L17
 E ANTIFREEZE/CT
 E E3+ALL

L19 22 S E2,E3 (L) PROTEIN

L20 7 S E2,E3 (L) PEPTIDE

L21 11 S E2,E3 (L) ?PEPTIDE?

L22 41 S E2,E3 (L) ?PROTEIN?

L23 1177 S L18-L22
 E RECRYSTALLIZATION/CT
 E E3+ALL

L24 17276 S E5
 E E4+ALL

L25 76344 S E4

L26 17 S L23 AND L24

L27 21 S L23 AND L25

L28 370 S L23 AND ?CRYST?

L29 73 S L23 AND ?RECRYST?

L30 88 S L26,L27,L29

L31 119 S L23 AND ?CRYO?
 E CRYOPRESERVATION/CT
 E E3+ALL

L32 27 S L23 AND E2

L33 66 S L23 AND (E3+OLD,NT,PFT,RT OR E4+OLD,NT,PFT,RT)
 E ICE/CT

L34 4 S E5 AND L23
 E E3+ALL

L35 132 S L23 AND E3,E2+OLD,NT,PFT

L36 223 S L23 AND (E8+OLD,NT,PFT,RT OR E9+OLD,NT,PFT,RT OR E10+OLD,NT,P
 E FREEZING POINT/CT

L37 118 S L23 AND (E3+OLD,NT,PFT,RT OR E4+OLD,NT,PFT,RT)
 E PRESERVATION/CT
 E E3+ALL

L38 55 S L23 AND E1+NT
 L39 280 S L23 AND (E17+OLD,NT,PFT,RT OR E16+OLD,NT,PFT,RT OR E15+OLD,NT
 L40 441 S L30-L39 AND (?PROTEIN? OR ?PEPTIDE?)
 L41 9 S L30-L39 AND (PROTEIN? OR PEPTIDE?)/SC,SX
 L42 441 S L40,L41
 L43 141 S L42 AND SOLUTION
 L44 10 S L4 AND L23
 L45 10 S L4 AND L5-L23
 L46 11 S L4 AND (?FREEZ? OR ?FROZ? OR ?CRYO? OR ?CRYSP?)
 L47 11 S L1,L44-L46
 L48 10 S L47 AND (?PROTEIN? OR ?PEPTIDE?)
 L49 1 S L47 AND (PROTEIN? OR PEPTIDE?)/SC,SX
 L50 10 S L48,L49
 L51 1 S L47 NOT L50
 E TENEBRIOS/CT
 L52 926 S E4+OLD,NT,PFT,RT
 L53 1091 S E3+OLD,NT,PFT,RT
 L54 1092 S E3-E7
 E E3+ALL
 E E6+ALL
 L55 3162 S E6+NT
 L56 32 S L23 AND L52-L55
 L57 42 S L23 AND (TENEBRION? OR T MOLITOR OR TENEBRI? MOLITOR)
 L58 12 S L42 AND L56,L57
 L59 4 S L43 AND L50,L58
 L60 21 S L1,L50,L58,L59
 L61 29 S L56,L57 NOT L60
 L62 476 S L42,L43,L60,L61
 L63 476 S L62 AND L1-L62
 L64 349 S L63 AND (PD<=20000608 OR PRD<=20000608 OR AD<=20000608)
 L65 349 S L64 AND (?PROTEIN? OR ?PEPTIDE?)
 L66 6 S L64 AND (PROTEIN? OR PEPTIDE?)/SC,SX
 L67 109 S L65,L66 AND SOLUTION
 L68 106 S L67 AND (ANTIFREEZ? OR RECRYSTAL?)
 L69 48 S L68 AND (INHIBIT? OR PROTECT?)
 L70 79 S L67 AND (PROTEIN# OR PEPTIDE# OR POLYPEPTIDE# OR GLYCOPEPTIDE
 L71 37 S L69 AND L70
 SEL DN AN 14 26 35
 L72 34 S L71 NOT E1-E9
 L73 42 S L70 NOT L71
 L74 30 S L73 AND ANTIFREEZE PROTEIN
 L75 12 S L73 NOT L74
 SEL DN AN 1 2 3 5
 L76 8 S L75 NOT E10-E21
 L77 11 S L69 NOT L70-L76
 SEL DN AN 1
 L78 10 S L77 NOT E22-E24
 L79 19 S L67,L68 NOT L69-L78
 SEL DN AN 13 17
 L80 17 S L79 NOT E25-E30
 L81 75 S L1,L50,L74,L76,L78,L80
 L82 75 S L81 AND L1-L81
 L83 75 S L82 AND (AFP? OR AFGP? OR THP? OR ANTIFREEZ? OR ANTI FREEZ? O
 L84 45 S L82 AND ?CRYSP?
 L85 75 S L82 AND (HYPOTHER? OR ?PRESERV? OR ?PROTECT? OR INHIBIT? OR P
 L86 75 S L82-L85
 L87 38 S L56,L57 NOT L86
 L88 24 S L87 AND (PD<=20000608 OR PRD<=20000608 OR AD<=20000608)
 L89 0 S L87 AND L4
 L90 99 S L86,L88
 L91 14 S L87 NOT L90

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FILE COVERS 1907 - 4 Aug 2004 VOL 141 ISS 6
 FILE LAST UPDATED: 3 Aug 2004 (20040803/ED)

This file contains CAS Registry Numbers for easy and accurate substance identification.

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L90 ANSWER 1 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 2003:427283 HCAPLUS
 DN 139:230977
 TI A serendipitous discovery of **antifreeze protein** -specific activity in C-linked **antifreeze glycoprotein** analogs
 AU Eniade, Adewale; Purushotham, Madhusudhan; Ben, Robert N.; Wang, J. B.; Horwath, Kathleen
 CS Department of Chemistry, State University of New York at Binghamton, Binghamton, NY, 13902, USA
 SO Cell Biochemistry and Biophysics (2003), 38(2), 115-124
 CODEN: CBBIFV; ISSN: 1085-9195
 PB Humana Press Inc.
 DT Journal
 LA English
 OS CASREACT 139:230977
 AB Structurally diverse carbon-linked (C-linked) analogs of **antifreeze glycoprotein (AFGP)** have been prepared via linear or convergent solid phase synthesis. These analogs range in mol. weight from approx 1.5-4.1 KDa and do not possess the β -D-galactose-1,3- α -D-N-acetylgalactosamine carbohydrate moiety or the L-threonine-L-alanine-L-alanine **polypeptide** backbone native to the **AFGP** wild-type. Despite these dramatic structural modifications, the 2.7-KDa and 4.1-KDa analogs possess **antifreeze protein**-specific activity as determined by **recrystn.-inhibition (RI)** and **thermal hysteresis (TH)** assays. These analogs are weaker than the wild-type in their activity, but nanoliter osmometry indicates that these compds. are binding to ice and affecting a localized f.p. depression. This is the first example of a C-linked **AFGP** analog that possesses TH and RI activity and suggests that the rational design and synthesis of chemical and biol. stable **AFGP** analogs is a feasible and worthwhile endeavor. Given the low degree of TH activity, these compds. may prove useful for the protection of cells during **freezing** and **thawing** cycles.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
----------------------------	---------------	--------------	-------------	--------------------------	-----------------

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Anisuzzaman, A	1988	174	265	Carb Res	HCAPLUS
Arya, P	1998	8	1127	Bioorg Med Chem Lett	HCAPLUS
Baardsnes, J	1999	463	87	FEBS Lett	HCAPLUS
Ben, R	2001	2	161	Chem BioChem	HCAPLUS
Ben, R	1999	11	1759	Org Lett	
Chakrabartty, A	1991	202	1057	Eur J Biochem	HCAPLUS
Chao, H	1997	36	14652	Biochemistry	HCAPLUS
Costanzo, J	1995	9	351	FASEB J	HCAPLUS
Davies, P	1997	7	828	Curr Opin Struct Bio	HCAPLUS
Davies, P	1990	4	2460	FASEB J	HCAPLUS
Eniade, A	2001	12	817	Bioconjugate Chem	HCAPLUS
Eniade, A	2001	2	557	Biomacromolecules	HCAPLUS
Feeaney, R	1978	32	191	Adv Protein Chem	HCAPLUS
Feeaney, R	1986	15	59	Annu Rev Biophys Che	HCAPLUS
Filira, F	1990	12	41	Int J Biol Macromol	HCAPLUS
Fletcher, G	1999	63	359	Annu Rev Physiol	
Griffith, M	1995	13	375	Biotech Adv	HCAPLUS
Hansen, T	1993	25	3182	Transplant Proc	HCAPLUS
Hayment, A	1998	430	301	FEBS Lett	
Haymet, A	1999	121	941	J Am Chem Soc	HCAPLUS
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Hays, L	1996	93	6835	Proc Natl Acad Sci U	HCAPLUS
Horwath, K	1996	93	419	Eur J Entomol	HCAPLUS
Houston, M	1998	273	11714	J Biol Chem	HCAPLUS
Knight, C	1998	2	55	Cryobiology	HCAPLUS
Knight, C	2000	406	249	Nature	HCAPLUS
Komatsu, S	1970	245	2909	J Biol Chem	HCAPLUS
Koushafar, H	1997	66	114	J Surg Oncol	HCAPLUS
Marcaurelle, L	1999	5	1384	Chem Eur J	HCAPLUS
Marron, T	1996	50	9037	Tetrahedron Lett	
Meldal, M	1990		483	J Chem Soc, Chem Com	HCAPLUS
Ramsay, J	1955	32	372	J Sci Instrument	HCAPLUS
Ravishankar, R	1998	120	11297	J Am Chem Soc	HCAPLUS
Raymond, J	1975		125	J Exp Zool	HCAPLUS
Sidebottom, C	2000	406	256	Nature	HCAPLUS
Tablin, F	1996	168	305	J Cell Physiol	HCAPLUS
Tomczak, M	2001	1151	255	Biochim Biophys Acta	
Tseng, P	2001	7	585	Chem Eur J	HCAPLUS
Tsuda, T	1996		2779	Chem Commun	HCAPLUS
Wang, J	1998	308	191	Carb Res	HCAPLUS
Weatherman, R	1996	35	3619	Biochemistry	HCAPLUS
Wierbicki, A	2000	1	268	Biomacromolecules	
Wilson, P	1993	14	31	Cryo-Lett	
Woltering, T	1996	50	9033	Tetrahedron Lett	
Zhang, W	1998	273	34806	J Biol Chem	HCAPLUS

L90 ANSWER 2 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2002:665225 HCAPLUS

DN 137:296776

TI Effective additives for preventing **recrystallization** in
ice-slurry systemsAU Lu, Shu-Shen; Inada, Takaaki; Yabe, Akira; Zhang, Xu; Grandum, Svein
CS Chemical Engineering Research Institute, South China University of
Technology, Peop. Rep. ChinaSO Proceedings of Symposium on Energy Engineering in the 21st Century,
Hong-Kong, China, Jan. 9-13, 2000 (2000), Volume 2, 860-865.
Editor(s): Cheng, Ping. Publisher: Begell House, Inc., New York, N. Y.

CODEN: 69DAS2

DT Conference

LA English

AB In **thermal-energy-storage** systems that use ice

slurry as the working fluid, the shape and size of the crystals must be optimized during the ice creation process. Therefore, methods for preventing ice from recrystg. during long-term storage, and long-distance transport should be developed. Here, for use in ice-slurry systems, we studied two potential additives in solution (concentration of 5 mg/mL), Tween surfactants and Polyvinyl Alc. (PVA), and compared their capability to inhibit recrystn. and to inhibit ice crystal growth with that of pure water and antifreeze proteins (AFPs). For Tween, we studied Tween 80, 81, and 85, and for PVA, we studied three different mol. wts. (31000-50000, 89000-98000, and 124000-186000 sep.). The inhibition of ice crystal growth was determined by optical microscopy, and the inhibition of recrystn. by the splat cooling method. The results showed that, among the additives studied here, PVA of mol. weight 31000-50000 was relatively more effective in inhibiting recrystn. and had better long-term solubility properties, thus making it a potential additive in ice-slurry cold-storage systems.

RETABLE

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Assender, H	1998	39	4295	Polymer	HCAPLUS
Davies, P	1997	7	828	Current Opinion Stru	HCAPLUS
Fukusako, S	1999			2R Working Party, "F	
Furukawa, Y	1992	61	776	Appl Phys	HCAPLUS
Grandum, S	1999			J Crystal Growth in	
Grandum, S	1997	11	461	J Thermophys HeatTra	HCAPLUS
Knight, C	1988	25	55	Cryobiology	MEDLINE
Knight, C	1995	32	23	Cryobiology	HCAPLUS
Macklin, W	1966	14	847	Phil Mag	HCAPLUS
Smaglik, P	1998	12	4	The Scientist	
Yeh, Y	1996	96	601	Chemical Reviews	HCAPLUS

L90 ANSWER 3 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2002:409049 HCAPLUS

DN 136:403489

TI Prevention of ice nucleation by polyglycerol

IN Fahy, Greg; Wowk, Brian

PA USA

SO U.S. Pat. Appl. Publ., 22 pp.

CODEN: USXXCO

DT Patent

LA English

FAN.CNT 4

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 2002063235	A1	20020530	US 2000-726857	20001130
	US 6616858	B2	20030909		
	US 2003027924	A1	20030206	US 2002-66285	20020201 <--
PRAI	US 1999-167963P	P	19991130	<--	
	US 2000-221691P	P	20000731		
	US 2000-726857	A2	20001130		
	US 2001-916396	A2	20010727		

AB Linear polymers of glycerol can prevent or delay ice nucleation in a variety of contexts. Polyglycerol can also be employed in combination with other ice control agents, such as polyvinyl alc./polyvinyl acetate copolymers and antifreeze proteins, to provide antinucleation effects that are superior to those of either polyglycerol or the coantinucleator alone. Polyglycerol has a number of advantageous phys. and toxicol. properties, such as extreme

annealing temperature for a length of time sufficient to allow for recrystn.; monitoring the ice crystal grain size changes over time; and determining the presence of functional thermal hysteresis proteins in said solution given the retention of significantly smaller ice crystal grain sizes relative to at least one control soln

These THP can be used for new techniques and compns. suitable for improving the preservation characteristics of organic materials at low temps., including storage of frozen foods, plasma, cells, plants, etc.

RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (R WK)	Referenced File
Tomchaney		21	716	Purification Composi	HCAPLUS

L90 ANSWER 5 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2001:898059 HCAPLUS

DN 136:243920

TI Development of an in vitro fat body cell system for assessing hormonal regulation of antifreeze protein production in the beetle, *Tenebrio molitor*

AU Easton, Christopher M.

CS State Univ. of New York, Binghamton, NY, USA

SO (2001) 257 pp. Avail.: UMI, Order No. DA3000717
From: Diss. Abstr. Int., B 2001, 62(1), 20

DT Dissertation

LA English

AB Unavailable

L90 ANSWER 6 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2001:685016 HCAPLUS

DN 136:305672

TI Hyperactive insect antifreeze protein from the beetle, *Tenebrio molitor*: from isolation to structure determination

AU Liou, Yih-Cherng

CS Queen's Univ., Kingston, ON, Can.

SO (2000) 172 pp. Avail.: UMI, Order No. DANQ52834
From: Diss. Abstr. Int., B 2001, 61(10), 5298

DT Dissertation

LA English

AB Unavailable

L90 ANSWER 7 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2000:785024 HCAPLUS

DN 134:39709

TI Developmental and environmental regulation of antifreeze proteins in the mealworm beetle *Tenebrio molitor*

AU Graham, Laurie A.; Walker, Virginia K.; Davies, Peter L.

CS Department of Biochemistry, Queen's University, Kingston, ON, K7L 3N6, Can.

SO European Journal of Biochemistry (2000), 267(21), 6452-6458
CODEN: EJBCAI; ISSN: 0014-2956

PB Blackwell Science Ltd.

DT Journal

LA English

AB The yellow mealworm beetle, *Tenebrio molitor*, contains a family of small Cys-rich and Thr-rich thermal hysteresis proteins that depress the hemolymph f.p. below the m.p. by as much as 5.5° (ΔT = thermal hysteresis). Thermal hysteresis protein expression was evaluated throughout development and after

water solubility, non-toxicity to human beings, non-toxicity to animal tissues and organs in vitro even at extreme concns., minimal foaming tendency, minimal retention on hydrophobic surfaces, and stability in soln. without the need for periodic heating to reactivate its antinucleation properties.

L90 ANSWER 4 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 2001:904220 HCAPLUS
 DN 136:49386
 TI Cloning of *Tenebrio molitor* antifreeze protein cDNAs, their properties and recombinant expression, and application as recrystn. inhibition factors thereof
 IN Horwath, Kathleen L.; Myers, Kevin L.; Easton, Christopher M.
 PA The Research Foundation of State University of New York, USA
 SO PCT Int. Appl., 363 pp.
 CODEN: PIXXD2
 DT Patent
 LA English
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2001094378	A1	20011213	WO 2001-US18532	20010607 <--
	W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
	RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
	US 2002172951	A1	20021121	US 2001-876348	20010607 <--
	US 2002173024	A1	20021121	US 2001-876796	20010607 <--
PRAI	US 2000-210446P	P	20000608 <--		
AB	<p>The invention provides protein and cDNA sequences for thermal hysteresis proteins (THPs) or antifreeze proteins (AFPs) derived from <i>Tenebrio molitor</i>, members of <i>Tenebrionoidea</i>. Type AFP Tm12.86 multigene family which lower the f.p. of a solution without effecting the m.p. These proteins include Tm12.86, Tm2.2, Tm3.4, Tm3.9, Tm7.5, Tm2.3, Tm12.84 and distantly related Tm13.17 (closely related to B1 accessory gland protein of <i>T. molitor</i>). The invention also discloses essential biochem. and cellular tools that make possible more direct cellular investigations, and an assessment of the relation between thermal hysteresis protein (THP) levels and antifreeze activity (both thermal hysteresis and recrystn. inhibition [RI]). Related methods for preparing recombinant said proteins and for providing antifreeze or recrystn. inhibition properties to a subject formulation. The purified, expressed THP protein can be directly added to an aqueous solution to depress the f.p., or transformed organisms expressing THP can be added to items which will be stored frozen. Also provided is a recrystn. inhibition method for determining the presence, relative concentration, and/or activity of thermal hysteresis proteins comprising: providing a proteinaceous composition in a solvent to form a test solution; flash freezing said solution; raising the temperature of the frozen solution to an appropriate annealing temperature that allows for a partial melt, while limiting heterogeneity in ice grain sizes within said solution; maintaining said frozen solution at the</p>				

exposure to altered environmental conditions. Under favorable growth conditions, small larvae (11-13 mg) had only low levels of **thermal hysteresis proteins or thermal hysteresis protein** message, but these levels increased 10-fold and 18-fold, resp., by the final larval instar (>190 mg), resulting in **thermal hysteresis** >3°. Exposure of small larvae (11-13 mg) to 4 wk of cold (4°) caused an ≈20-fold increase in **thermal hysteresis protein** concentration, well in excess of the less than threefold developmental increase seen after 4 wk at 22°. Exposure of large larvae (100-120 mg) to cold caused 12-fold and sixfold increases in **thermal hysteresis protein** message and protein levels, resp., approx. double the maximum levels they would have attained in the final larval instar at 22°. Thus, **thermal hysteresis** increased to similar levels (>4°) in the cold, irresp. of the size of the larvae (the overwintering stage). At pupation, **thermal hysteresis protein** message levels decreased >20-fold and remained low thereafter, but **thermal hysteresis** activity decreased much more slowly. Exposure to cold did not reverse this decline. Desiccation or starvation of larvae had comparable effects to cold exposure, but surprisingly, short daylength photoperiod or total darkness had no effect on either **thermal hysteresis** or message levels. As all environmental conditions that caused increased **thermal hysteresis** also inhibited growth, the authors postulate that developmental arrest is a primary factor in the regulation of *T. molitor* **thermal hysteresis proteins**.

RETABLE

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Beck, S	1971	64	149	Ann Entomol Soc Am	
Bell, C	1994	30	99	J Stored Prod Res	
Bradford, M	1976	72	248	Anal Biochem	HCAPLUS
Burges, H	1963	54	571	Bull Entomol Res	
Cotton, R	1929	95	1	Techn Bull US Dept A	
Denlinger, D	1991		174	Insects at Low Tempe	
Duman, J	1998	168	225	J Comp Physiol B	HCAPLUS
Ewart, K	1999	55	271	Cell Mol Life Sci	HCAPLUS
Glantz, S	1992			Primer of Biostatist	
Graham, L	1996	18	296	Dev Genet	HCAPLUS
Graham, L	1996	26	127	Insect Biochem Mol B	HCAPLUS
Graham, L	1997	388	727	Nature	HCAPLUS
Han, E	1995	41	981	J Insect Physiol	HCAPLUS
Hodkova, M	1997	34	70	Cryobiology	
Horwath, K	1996	93	419	Eur J Entomol	HCAPLUS
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Kroeker, E	1991	17	169	Arch Insect Biochem	HCAPLUS
Lindgren, D	1955	24	1	Hilgardia	
Liou, Y	1999	38	11415	Biochemistry	HCAPLUS
Mischke, D	1982	156	449	J Mol Biol	HCAPLUS
Patterson, J	1978	74	37	J Exp Biol	
Ramsey, J	1964	248	279	Phil Trans R Soc Lon	
Tschinkel, W	1971	176	137	J Exp Zool	MEDLINE

L90 ANSWER 8 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2000:606434 HCAPLUS

DN 133:364125

TI Control of molecular-level ice crystallization using
antifreeze protein and silane coupling agent

AU Inada, T.; Yabe, A.; Grandum, S.; Saito, T.

CS Mechanical Engineering Laboratory, MITI, AIST, Ibaraki, 305-8564, Japan
 SO Materials Science & Engineering, A: Structural Materials: Properties,
 Microstructure and Processing (2000), A292(2), 149-154
 CODEN: MSAPE3; ISSN: 0921-5093
 PB Elsevier Science S.A.
 DT Journal
 LA English
 AB To obtain acceptable ice-slurry characteristics for low-temperature energy storage and transport systems, methods for preventing ice recrystn. must be developed. **Antifreeze proteins (AFPs)** are known to be an effective additive in ice-slurry systems, making ice slurries resistant to recrystn., and thereby improving flowability. However, **AFPs** are expensive and easily degrade. Therefore, we investigated the use of silane coupling agents (SCAs) as substitutes for **AFPs**. To determine the SCA's ability to control crystallization, in this study we observed free growth of **ice crystals** in SCA solns., and found that SCAs that form long-chain mols. in water are effective for crystallization control. Then we analyzed **ice crystal** surfaces containing **AFPs** and SCAs by using scanning tunneling microscopy (STM) to investigate the mechanism of **crystn** control with these additives. STM observation of **ice crystal** surfaces showed that the **AFP** mols. are adsorbed onto the **ice crystal** surface on the {2021} planes along the <0112> directions, preventing further **crystal** growth from the site where the **AFP** mols. are adsorbed. Furthermore, we found that long-chain SCA mols. are adsorbed onto **ice crystal** surfaces, preventing **crystal** growth from the site where the long-chain SCA mols. are adsorbed.

RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (RWK)	Referenced File
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Chou, K	1992	223	509	J Mol Biol	HCAPLUS
DeVries, A	1969	163	1074	Science	
Feeaney, R	1986	15	59	Annu Rev Biophys Bio	HCAPLUS
Grandum, S	1999	205	382	J Crystal Growth	HCAPLUS
Grandum, S	1997	11	461	J Thermophys Heat Tr	HCAPLUS
Jorgensen, H	1993	6	19	Protein Eng	HCAPLUS
Knight, C	1991	59	409	Biophys J	HCAPLUS
Knight, C	1993	64	252	Biophys J	HCAPLUS
Lal, M	1993	95	299	Faraday Discuss	HCAPLUS
Madura, J	1994	116	417	J Am Chem Soc	HCAPLUS
McDonald, S	1995	41	959	AIChE J	HCAPLUS
Ogawa, K	1995			Abstract Booklet Eig	
Wen, D	1993	317	31	Federation Eur Bioch	HCAPLUS
Wen, D	1993	268	16401	J Biol Chem	HCAPLUS
Yang, D	1988	333	232	Nature	HCAPLUS

L90 ANSWER 9 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2000:575875 HCAPLUS

DN 133:183645

TI Adsorption of **antifreeze glucoprotein (AFGP)** at **ice/water** interface and its effect for interfacial pattern formation

AU Inohara, Naomi; Furukawa, Yoshinori

CS Inst. Low Temp. Science, Hokkaido Univ., Japan

SO Nippon Kessho Seicho Gakkaishi (2000), 27(1), 53

CODEN: NKSGDK; ISSN: 0385-6275

PB Nippon Kessho Seicho Gakkai

DT Journal

LA Japanese

AB The ice crystal growth from the solution of AFGP was observed in situ using the method of unidirectional growth. The serrate pattern, which was consisted by {1010} faces of ice crystal, was observed. The pattern formation mechanism is discussed in relation to the adsorption properties of AFGP at the ice/H₂O interfaces.

L90 ANSWER 10 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 2000:556413 HCPLUS
 DN 133:277747
 TI Mimicry of ice structure by surface hydroxyls and water of a β -helix antifreeze protein
 AU Liou, Yih-Cherng; Tocilj, Ante; Davies, Peter L.; Jia, Zongchao
 CS Department of Biochemistry, Queen's University, Kingston, ON, K7L 3N6, Can.
 SO Nature (London) (2000), 406(6793), 322-325
 CODEN: NATUAS; ISSN: 0028-0836
 PB Nature Publishing Group
 DT Journal
 LA English
 AB Insect antifreeze proteins (AFP) are much more effective than fish AFPs at depressing solution f.ps. by ice-growth inhibition. AFP from the beetle *Tenebrio molitor* is a small protein (8.4 kDa) composed of tandem 12-residue repeats (TCTxSxxCxxAx). Here we report its 1.4-Å resolution crystal structure, showing that this repetitive sequence translates into an exceptionally regular β -helix. Not only are the 12-amino-acid loops almost identical in the backbone, but also the conserved side chains are positioned in essentially identical orientations, making this AFP perhaps the most regular protein structure yet observed. The protein has almost no hydrophobic core but is stabilized by numerous disulfide and hydrogen bonds. On the conserved side of the protein, threonine-cysteine-threonine motifs are arrayed to form a flat β -sheet, the putative ice-binding surface. The threonine side chains have exactly the same rotameric conformation and the spacing between OH groups is a near-perfect match to the ice lattice. Together with tightly bound co-planar external water, three ranks of oxygen atoms form a two-dimensional array, mimicking an ice section.

RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (RWK)	Referenced File
Brunger, A	1998	54	905	Acta Cryst D	
Chen, L	1991	88	4240	Proc Natl Acad Sci U S A	HCPLUS
Davies, P	1997	7	828	Curr Opin Struct Biol	HCPLUS
de La Fortelle, E	1997	276	472	Methods in Enzymology	HCPLUS
Duman, J	1998	168	225	J Comp Physiol B	HCPLUS
Graether, S	2000	406	325	Nature	MEDLINE
Graham, L	1997	388	727	Nature	HCPLUS
Jenkins, J	1998	122	236	J Struct Biol	HCPLUS
Jia, Z	1996	384	285	Nature	HCPLUS
Jones, T	1991	47	110	Acta Cryst A	
Knight, C	1993	64	252	Biophys J	HCPLUS
Kraulis, P	1991	24	946	J Appl Crystallogr	
Laskowski, R	1993	26	283	J Appl Crystallogr	HCPLUS
Li, N	1998	37	6343	Biochemistry	HCPLUS
Liou, Y	2000	56	354	Acta Cryst D	
Liou, Y	1999	38	11415	Biochemistry	HCPLUS
Liou, Y	2000	19	148	Protein Expr Purif	HCPLUS
Mayans, O	1997	5	677	Structure	HCPLUS
Nicholls, A	1991	11	281	Proteins	HCPLUS
Petersen, T	1997	5	533	Structure	HCPLUS
Raetz, C	1995	270	997	Science	HCPLUS

Sheldrick, G	1997	276	319	Methods in Enzymology	
Sicheri, F	1995	375	427	Nature	HCAPLUS
Steinbacher, S	1994	265	383	Science	HCAPLUS
Tyshenko, M	1997	15	887	Nature Biotechnol	HCAPLUS
Yoder, M	1993	260	1503	Science	HCAPLUS

L90 ANSWER 11 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2000:406324 HCAPLUS

DN 134:68337

TI Vitrification enhancement by synthetic ice blocking agents

AU Wowk, Brian; Leitl, Eugen; Rasch, Christopher M.; Mesbah-Karimi, Nooshin; Harris, Steven B.; Fahy, Gregory M.

CS 21st Century Medicine, Inc., Rancho Cucamonga, CA, 91730, USA

SO Cryobiology (2000), 40(3), 228-236

CODEN: CRYBAS; ISSN: 0011-2240

PB Academic Press

DT Journal

LA English

AB Small concns. of the synthetic polymer polyvinyl alc. (PVA)

inhibited formation of ice in water/
cryoprotectant solns. Ice inhibitionimproved with decreasing mol. weight. A PVA copolymer of mol. weight 2 kDa
consisting of 20% vinyl acetate was particularly effective. PVA copolymer
concn. of 0.001, 0.01, 0.1, and 1% weight/weight decreased the concentration

of

glycerol required to vitrify in a 10-mL volume by 1, 3, 4, and 5%
weight/weight,resp. DMSO concns. required for vitrification were also reduced by 1, 2,
2, and 3% weight/weight, resp. Crystallization of ice on

borosilicate glass in contact with cryoprotectant solns

. was inhibited by only 1 ppm of PVA copolymer. Devitrification
of ethylene glycol solns. was also strongly inhibitedby PVA copolymer. Visual observation and differential scanning
calorimeter data suggest that PVA blocks ice primarily by

inhibition of heterogeneous nucleation. PVA thus appears to

preferentially bind and inactivate heterogeneous nucleators and/or nascent
ice crystals in a manner similar to that of natural
antifreeze proteins found in cold-hardyfish and insects. Synthetic PVA-derived ice blocking
agents can be produced much less expensively than antifreeze
proteins, offering new opportunities for improving
cryopreservation by vitrification. (c) 2000 Academic Press.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Caple, G	1983	4	51	Cryo-Lett	HCAPLUS
Carroll, J	1993	48	606	Biol Reprod	HCAPLUS
Chang, Z	1991	12	215	Cryo-Lett	HCAPLUS
Devries, A	1969	163	1074	Science	
Fahy, G				WO PCTUS9604284	
Fahy, G	1996			WO 9630459	HCAPLUS
Fahy, G	1995		315	Biological Ice Nucle	
Fahy, G	1984	21	407	Cryobiology	HCAPLUS
Fahy, G	1990	27	492	Cryobiology	MEDLINE
Fahy, G	1997	24	114	Cryobiology	
Fox, M	1997			"Organic Chemistry,"	
Hey, J	1996	33	205	Cryobiology	HCAPLUS
Hey, J	1998	37	119	Cryobiology	HCAPLUS
Klotz, I	1970		5	The Frozen Cell	HCAPLUS
Naitana, S	1997	48	247	Anim Reprod Sci	HCAPLUS
O'Neil, L	1998	37	59	Cryobiology	HCAPLUS
Palasz, A	1993	30	172	Cryobiology	HCAPLUS

Parody-Morreale, A	1988	333	782	Nature	HCAPLUS
Schmehl, M	1986	23	512	Cryobiology	HCAPLUS
Sommerfeld, V	1999	38	95	Cryobiology	HCAPLUS
Sutton, R	1993	14	13	Cryo-Lett	HCAPLUS
Tomchaney, A	1982	16	716	Biochemistry	
Wilson, P	1995	68	2098	Biophys J	HCAPLUS
Wowk, B	1999	39	280	Cryobiology	

L90 ANSWER 12 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2000:369350 HCAPLUS

DN 133:161008

TI Folding and structural characterization of highly disulfide-bonded beetle antifreeze protein produced in bacteria

AU Liou, Yih-Cherng; Daley, Margaret E.; Graham, Laurie A.; Kay, Cyril M.; Walker, Virginia K.; Sykes, Brian D.; Davies, Peter L.

CS Department of Biochemistry, Queen's University, Kingston, ON, K7L 3N6, Can.

SO Protein Expression and Purification (2000), 19(1), 148-157

CODEN: PEXPEJ; ISSN: 1046-5928

PB Academic Press

DT Journal

LA English

AB The hyperactive antifreeze protein from the beetle, *Tenebrio molitor*, is an 8.5-kDa, threonine-rich protein containing 16 Cys residues, all of which are involved in disulfide bonds. When produced by *Escherichia coli*, the protein accumulated in the supernatant in an inactive, unfolded state. Its correct folding required days or weeks of oxidation at 22 or 4°C, resp., and its purification included the removal of imperfectly folded forms by reversed-phase HPLC. NMR spectroscopy was used to assess the degree of folding of each preparation. One-dimensional 1H and two-dimensional 1H total correlation spectroscopy spectra were particularly helpful in establishing the characteristics of the fully folded antifreeze in comparison to less well-folded forms. The recombinant antifreeze had no free -SH groups and was rapidly and completely inactivated by 10 mM DTT. It had a thermal hysteresis activity of 2.5°C at a concentration of 1 mg/mL, whereas fish antifreeze proteins typically show a thermal hysteresis of .apprx.1.0°C at 10-20 mg/mL. The CD spectra of the beetle antifreeze had a superficial resemblance to those of α -helical proteins, but deconvolution of the spectra indicated the absence of α -helix and the presence of β -structure and coil. NMR anal. and secondary structure predictions agree with the CD data and are consistent with a β -helix model proposed for the antifreeze on the basis of its 12-amino-acid repeating structure and presumptive disulfide bond arrangement. (c) 2000 Academic Press.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Braunschweiler, L	1983	53	521	J Magn Reson	HCAPLUS
Chakrabartty, A	1991	202	1057	Eur J Biochem	HCAPLUS
Cheng, C	1999	8	715	Curr Opin Genet Dev	
Cohn, E	1943		157	Proteins, Amino Acid	
Davies, D	1985	107	2820	J Am Chem Soc	
Davies, P	1997	7	828	Curr Opin Struct Bio	HCAPLUS
Duman, J	1998	168	225	J Comp Physiol B	HCAPLUS
Eisenhaber, F	1996	25	157	Struct Funct Design	HCAPLUS
Eisenhaber, F	1996	25	169	Struct Funct Design	HCAPLUS
Ewart, K	1999	55	271	Cell Mol Life Sci	HCAPLUS
Gauthier, S	1998	258	445	Eur J Biochem	HCAPLUS
Graham, L	1997	388	727	Nature	HCAPLUS

Hayes, D	1995		Sedimentation Interp	
Johnson, M	1981	36	575	Biophys J
Knight, C	1991	59	409	Biophys J
Li, N	1998	37	6343	Biochemistry
Liou, Y	1999	38	11415	Biochemistry
Perczel, A	1992	203	83	Anal Biochem
Ramsey, J	1964	248	279	Phil T R Soc B
Raymond, J	1997	74	2589	Proc Natl Acad Sci
Sicheri, F	1995	375	427	Nature
Tyshenko, M	1997	15	887	Nature Biotechnol
Wishart, D	1991	293	72	FEBS Lett
Yeh, Y	1996	96	601	Chem Rev
Yphantis, D	1991			Nonlinear Least Squa

L90 ANSWER 13 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 2000:328802 HCPLUS

TI Simulations of **Tenebrio molitor** in water.

AU Baran, Kelli L.; Madura, Jeffry D.

CS Department of Chemistry & Biochemistry, Duquesne University, Pittsburgh, PA, 15282, USA

SO Book of Abstracts, 219th ACS National Meeting, San Francisco, CA, March 26-30, 2000 (2000), CHER-660 Publisher: American Chemical Society, Washington, D. C.

CODEN: 69CLAC

DT Conference; Meeting Abstract

LA English

AB The study of **thermal hysteresis proteins** (**THPs**) has recently gained attention with regards to its interactions at the ice/water interface. Insect **THPs** have unusually high **thermal hysteresis** activity as compared against the **thermal hysteresis** of the fish AFPs, for which there are solved 3-D structures. It is important to determine the 3-D structure of other **THPs** as well so that the interactions between the **THP** and the ice/water interface can be studied to gain insight into the increased **thermal hysteresis**. We are using long term mol. dynamics simulations along with the homol. modeling tools of MOE (Mol. Object Environment by Chemical Computing Group, Inc.) to predict a 3-D structure of the yellow mealworm beetle **Tenebrio molitor** from its primary sequence and exptl. determined disulfide bridges. We will present the results from a 30 ns trajectory of the **Tenebrio molitor** in water.

L90 ANSWER 14 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 2000:239282 HCPLUS

DN 132:326364

TI Adsorption kinetics in the solution of a **thermal hysteresis protein**

AU Li, Q.; Luo, L.

CS Physics Department, Laboratory of Theoretical Physics and Biology, Inner Mongolia University, Hohhot, Peop. Rep. China

SO Chemical Physics Letters (2000), 320(3,4), 335-338

CODEN: CHPLBC; ISSN: 0009-2614

PB Elsevier Science B.V.

DT Journal

LA English

AB According to the properties of the interactions between the **thermal hysteresis proteins** (**THPs**) and an ice crystal surface in the **THP** solution, the authors present a kinetic theory of the adsorption of **thermal hysteresis proteins** on the ice crystal surface. The **thermal hysteresis** activities of the **THP** solns. are given. The cooperative properties in the adsorption process of the **THPs** on

the ice crystal surface are discussed.

RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (R WK)	Referenced File
Burcham, T	1986	261	6390	J Biol Chem	HCAPLUS
Davies, P	1990	4	2460	FASEB J	HCAPLUS
Li, Q	1993	216	453	Chem Phys Lett	HCAPLUS
Li, Q	1994	223	181	Chem Phys Lett	HCAPLUS
Li, Q	1999	30	588	Neimongol	HCAPLUS
Miller, A	1947	43	232	Proc Cambridge Philo	HCAPLUS
Tomchaney, A	1982	21	716	Biochemistry	HCAPLUS
Wilson, P	1995	68	2089	Biophys J	HCAPLUS
Yeh, Y	1996	96	601	Chem Rev	HCAPLUS

L90 ANSWER 15 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2000:190068 HCAPLUS

DN 132:233299

TI Crystallization and preliminary x-ray analysis of insect antifreeze protein from the beetle *Tenebrio molitor*

AU Liou, Yih-Cherng; Davies, Peter L.; Jia, Zongchao

CS Department of Biochemistry, Queen's University, Kingston, ON, K7L 3N6, Can.

SO Acta Crystallographica, Section D: Biological Crystallography (2000), D56(3), 354-356

CODEN: ABCRE6; ISSN: 0907-4449

PB Munksgaard International Publishers Ltd.

DT Journal

LA English

AB Hyperactive antifreeze protein from the beetle

T. molitor (TmAFP) was produced in *Escherichia coli* and purified by gel-permeation chromatog. and HPLC. An iodinated derivative was prepared by incubating the 8.5-kDa TmAFP with N-iodosuccinimide. Native and iodinated TmAFP produced 2 different crystal forms when crystallized using the hanging-drop vapor-diffusion technique. The native crystals were rectangular plates that diffracted to .apprx.2.5 Å resolution. They were monoclinic and belonged to space group P21, with unit-cell dimensions a = 38.4, b = 73.4, c = 59.3 Å, and β = 97.0°. Crystals of iodinated TmAFP formed elongated hexagons that allowed data to be collected to .apprx.1.4 Å. These crystals belonged to space group P61 (or P65), with unit-cell dimensions a = 73.85, b = 73.85, c = 53.15 Å. There were 2 mols. per asym. unit, which corresponded to Vm = 2.46 Å³ and 51% solvent content. A 2-fold noncrystallog. symmetry was evident from self-rotation calcns.

RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (R WK)	Referenced File
Crowther, R	1972		173	The Molecular Replac	
Davies, P	1997	7	828	Curr Opin Struct Bio	HCAPLUS
Deng, G	1998	1388	305	Biochim Biophys Acta	HCAPLUS
Duman, J	1998	168	225	J Comput Physiol B	HCAPLUS
Ewart, K	1999	55	271	Cell Mol Life Sci	HCAPLUS
Graether, S	1999	126	72	J Struct Biol	HCAPLUS
Graham, L	1997	388	727	Nature	HCAPLUS
Gronwald, W	1998	37	4712	Biochemistry	HCAPLUS
Jancarik, J	1991	24	409	J Appl Cryst	HCAPLUS
Jia, Z	1996	384	285	Nature	HCAPLUS
Knight, C	1991	59	409	Biophys J	HCAPLUS
Li, N	1998	37	6343	Biochemistry	HCAPLUS
Liou, Y	1999	38	11415	Biochemistry	HCAPLUS
Matthews, B	1968	33	491	J Mol Biol	HCAPLUS

Otwinowski, Z	1968	276	307	Methods Enzymol	
Raymond, J	1977	74	2589	Proc Natl Acad Sci U	HCAPLUS
Sicheri, F	1995	375	427	Nature	HCAPLUS
Tyshenko, M	1997	15	887	Nature Biotechnol	HCAPLUS
Yang, D	1998	74	2142	Biophys J	HCAPLUS
Yeh, Y	1996	96	601	Chem Rev	HCAPLUS

L90 ANSWER 16 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2000:15233 HCAPLUS

DN 132:89240

TI Protein and cDNA sequences encoding *Myoxocephalus scorpius* antifreeze protein, and uses thereof in improving the palatability of cold foods/liquids and in making cells cold-resistant

IN Hew, Choy L.

PA HSC Research and Development Limited Partnership, Can.

SO PCT Int. Appl., 61 pp.

CODEN: PIXXD2

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2000000512	A2	20000106	WO 1999-CA601	19990625 <--
	WO 2000000512	A3	20000316		
	W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
	RW: GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
	US 6429293	B1	20020806	US 1999-344529	19990624 <--
	AU 9944941	A1	20000117	AU 1999-44941	19990625 <--
PRAI	US 1998-90794P	P	19980626	<--	
	US 1998-95713P	P	19980807	<--	
	US 1999-344529	A	19990624	<--	
	US 1998-90794	P	19980626	<--	
	US 1998-95713	P	19980807	<--	
	WO 1999-CA601	W	19990625	<--	

AB The invention provides protein and cDNA sequences encoding intracellular "sculpin-type" antifreeze proteins (AFPs) which were isolated from shorthorn sculpin (*Myoxocephalus scorpius*). The AFPs of the present invention are alanine-rich polypeptides that are synthesized in the peripheral tissues such as the skin and gills of fish. These skin-type AFPs are encoded by a distinct set of AFP genes that lack a signal peptide, which is indicative of their intracellular location. The AFPs are used to make cells cold resistant and to improve the palatability of cold foods and liqs. Cold-resistant eukaryotes and prokaryotes, including plants, animals and bacteria are made using the disclosed genes/AFPs. Moreover, the present invention provides methods for preserving cells, tissues and organs ex vivo using the AFPs described herein.

L90 ANSWER 17 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1999:818908 HCAPLUS

DN 132:48231

TI Spruce budworm antifreeze proteins, nucleotide and amino acid sequences, and the method of producing recombinant proteins

IN Walker, Virginia K.; Davies, Peter L.; Rahavard, Mitra; Tyshenko, Michael G.

PA Queen's University At Kingston, Can.

SO U.S., 27 pp., Cont.-in-part of U.S. Ser. No. 657,264, abandoned.
CODEN: USXXAM

DT Patent

LA English

FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 6008016	A	19991228	US 1997-868594	19970603 <--
	CN 1221450	A	19990630	CN 1997-195223	19970603 <--
	KR 2000016268	A	20000325	KR 1998-709841	19981203 <--
	US 6348569	B1	20020219	US 1999-434323	19991104 <--
PRAI	US 1996-657264	B2	19960603	<--	
	US 1997-868594	A3	19970603	<--	

AB A novel class of **thermal hysteresis, antifreeze proteins (THPs)** has been isolated and purified from *Choristoneura* sp., including the eastern spruce budworm *C. fumiferana*. The amino acid and cloned cDNA sequences for these **antifreeze proteins** and their fragments are reported. The method of producing recombinant **proteins** and expressing them in fungal, yeast, bacteria, **plant, or fish** cells is claimed. Polyclonal antibodies reactive to these novel **antifreeze proteins** were raised for detecting **THPs** in western blots and screening a recombinant expression library. The invention also includes a method for decreasing the f.p. of an aqueous **solution** by adding these **antifreeze proteins** to the **soln**. that may be of use in preventing **freeze/thaw damage** of **frozen foods, e.g. fish.**

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Chakrabarty, A	1991	202	1057	Eur J Biochem	HCAPLUS
Davies, P	1990	4	2460	FASEB J	HCAPLUS
DeVries	1983	45	245	Annu Rev Physiol	HCAPLUS
Duman	1997			US 5627051	HCAPLUS
Duman	1997			US 5633451	HCAPLUS
Duman, J	1983	45	261	Ann Rev Physiol	HCAPLUS
Fourney, R	1984	62	28	Can J Zool	HCAPLUS
Griffith, M	1995	13	375	Biotechnology Advanc	HCAPLUS
Hayes, P	1989	264	18761	The Journal of Biolo	HCAPLUS
Hew, C	1983	61	2324	Can J Zool	HCAPLUS
Lawson	1991	88	9919	Proc Natl Acad Sci	HCAPLUS
Li, X		260	12904	J Biol Chem	HCAPLUS
Ng, N	1986	261	15690	J Biol Chem	HCAPLUS
Ochman, H	1988	120	621	Genetics	HCAPLUS
Patterson	1979	210	361	J Exp Zool	HCAPLUS
Rubin, G	1983	11	6341	Nucl Acids Res	HCAPLUS
Rubin, G	1982	218	348	Science	HCAPLUS
Rubinsky	1994			US 5358931	HCAPLUS
Saiki, R	1985	230	1350	Science	HCAPLUS
Slaughter, D	1981	256	2022	J Biol Chem	HCAPLUS
Tang, W	1994			American Society for	
Thomashow	1994			US 5296462	HCAPLUS
Thomashow	1994			US 5356816	HCAPLUS
Tomchaney, A	1982	21	716	Biochem	HCAPLUS
Warren	1992			US 5118792	HCAPLUS
Wu	1991	161	271	J Comp Physiol B	HCAPLUS
Yin, Y	1996	96	601	Chemical Reviews	

AN 1999:802390 HCPLUS
 DN 132:162553
 TI Further study on the chemical kinetics of thermal
 hysteresis protein activity
 AU Li, Qian-zhong
 CS Laboratory of Theoretical Physics and Biology, NeiMongol Univ., Hohhot,
 010021, Peop. Rep. China
 SO Neimenggu Daxue Xuebao, Ziran Kexueban (1999), 30(5), 588-591
 CODEN: NDZKEJ; ISSN: 1000-1638
 PB Neimenggu Daxue Xuebao Bianjibu
 DT Journal
 LA Chinese
 AB According to the properties of the interactions between the
 antifreezes and ice crystal surface in
 thermal hysteresis protein, we present the
 adsorption kinetic theory of the thermal hysteresis
 protein on the ice crystal surface. The
 formula of the expression on activity of thermal
 hysteresis protein is deduced. The thermal
 hystereses of The THP solns. are calculated. The
 cooperative properties in the adsorption process of thermal
 hysteresis protein on ice crystal
 surface are discussed.

L90 ANSWER 19 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1999:793508 HCPLUS
 DN 132:133767
 TI New ice-binding face for type I antifreeze
 protein
 AU Baardsnes, J.; Kondejewski, L. H.; Hodges, R. S.; Chao, H.; Kay, C.;
 Davies, P. L.
 CS Department of Biochemistry and the Protein Engineering Network of Centres
 of Excellence, Queen's University, Kingston, ON, Can.
 SO FEBS Letters (1999), 463(1,2), 87-91
 CODEN: FEBLAL; ISSN: 0014-5793
 PB Elsevier Science B.V.
 DT Journal
 LA English
 AB Type I antifreeze protein (AFP) from winter
 flounder is an alanine-rich, 37 amino acid, single α -helix that
 contains three 11 amino acid repeats (Thr-X2-Asx-X7), where X is generally
 Ala. The regularly spaced Thr, Asx and Leu residues lie on one face of
 the helix and have traditionally been thought to form hydrogen bonds and
 van der Waals interactions with the ice surface. Recently,
 substitution expts. have called into question the importance of Leu and
 Asn for ice-binding. Sequence alignments of five type I
 AFP isoforms show that Leu and Asn are not well conserved, whereas
 Ala residues adjacent to the Thr, at right angles to the Leu/Asn-rich
 face, are completely conserved. To investigate the role of these Ala
 residues, a series of Ala to Leu steric mutations was made at various
 points around the helix. All the substituted peptides were
 fully α -helical and remained as monomers in solution
 Wild-type activity was retained in A19L and A20L. A17L, where the
 substitution lies adjacent to the Thr-rich face, had no detectable
 antifreeze activity. The nearby A21L substitution had 10%
 wild-type activity and demonstrated weak interactions with the ice
 surface. We propose a new ice-binding face for type I
 AFP that encompasses the conserved Ala-rich surface and adjacent
 Thr.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
----------------------------	---------------	--------------	-------------	--------------------------	--------------------

Chakrabartty, A	1991	202	1057	Eur J Biochem	HCAPLUS
Chakrabartty, A	1989	264	11307	J Biol Chem	HCAPLUS
Chao, H	1997	36	14652	Biochemistry	HCAPLUS
Chao, H	1994	3	1760	Protein Sci	HCAPLUS
Chao, H	1996	5	1150	Protein Sci	HCAPLUS
Cheng, A	1997	73	2851	Biophys J	HCAPLUS
Cheng, C	1991		1	Life Under Extreme C	
Chou, K	1992	223	509	J Mol Biol	HCAPLUS
Davies, P	1997	7	828	Curr Opin Struct Bio	HCAPLUS
Davies, P	1982	79	335	Proc Natl Acad Sci	HCAPLUS
DeLuca, C	1998	74	1502	Biophys J	HCAPLUS
DeVries, A	1977	495	388	Biochem Biophys Acta	HCAPLUS
DeVries, A	1970	245	2901	J Biol Chem	HCAPLUS
DeVries, A	1969	163	1073	Science	HCAPLUS
Deng, G	1997	402	17	FEBS Lett	HCAPLUS
Ewart, K	1999	55	271	Cell Mol Life Sci	HCAPLUS
Fourney, R	1984	62	28	Can J Zool	HCAPLUS
Gronwald, W	1996	35	16698	Biochemistry	HCAPLUS
Harding, M	1999	264	653	Eur J Biochem	HCAPLUS
Haymet, A	1998	430	301	FEBS Lett	HCAPLUS
Haymet, A	1999	121	941	J Am Chem Soc	HCAPLUS
Hodges, R	1988	1	19	Pept Res	HCAPLUS
Knight, C	1991	59	409	Biophys J	HCAPLUS
Knight, C	1993	64	252	Biophys J	HCAPLUS
Loewen, M	1998	37	17745	Biochemistry	HCAPLUS
Loewen, M	1999	38	4743	Biochemistry	HCAPLUS
Pickett, M	1984	143	35	Eur J Biochem	HCAPLUS
Pickett, M	1984	143	35	Eur J Biochem	HCAPLUS
Scott, G	1987	168	629	Eur J Biochem	HCAPLUS
Sicheri, F	1995	375	427	Nature	HCAPLUS
Wen, D	1992	63	1659	Biophys J	HCAPLUS
Wen, D	1992	267	14102	J Biol Chem	HCAPLUS
Wen, D	1993	268	16396	J Biol Chem	HCAPLUS
Wen, D	1993	268	16401	J Biol Chem	HCAPLUS
Yeh, Y	1996	96	601	Chem Rev	HCAPLUS
Zhang, W	1999	455	372	FEBS Lett	HCAPLUS
Zhang, W	1998	273	34806	J Biol Chem	HCAPLUS

L90 ANSWER 20 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1999:733923 HCAPLUS

DN 131:333483

TI Cryo-bioorganic chemistry. Molecular interactions at low temperature

AU Vajda, T.

CS Department Organic Chemistry, Eotvos Univ., Budapest, H-1518, Hung.

SO Cellular and Molecular Life Sciences (1999), 56(5/6), 398-414

CODEN: CMLSF1; ISSN: 1420-682X

PB Birkhaeuser Verlag

DT Journal; General Review

LA English

AB This review with 104 refs. illustrates the differences between frozen and liquid conditions on several small and large biomols., together with the synthetic use of freezing. Freezing of aqueous or organic solns. plays a pivotal role in enhancement of rate and/or yield of biomol. reactions. The smooth conditions of the frozen state at low temperature can also suppress racemization and side-product formation of the reactions. Mol. interactions in liquid undercooled solns., on the other hand, offer the possibility to study enzyme activity mechanisms in vitro and a chance for survival of organisms in vivo. In relation to the freezing effect on enzyme activity, a peculiar phenomenon is discussed: "cryo-oscillations" are temporal motions of trypsin activity in frozen solution in the presence of Mn²⁺ ion. The mol. basis of cold

adaptation is also discussed, which points to mechanisms evolved by organisms living at subzero temps. The factors involved in the freezing effect are shown; i.e. the role of freeze-concentration and frozen solvent surface is demonstrated and elucidated using several examples.

RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (RWK)	Referenced File
Akerlof, G	1936	58	1241	J Am Chem Soc	HCAPLUS
Alber, T	1976	263	279	Nature	HCAPLUS
Baek, H	1992	114	718	J Am Chem Soc	HCAPLUS
Balls, A	1938	3	57	Food Res	HCAPLUS
Barman, T	1986	68	1041	Biochim	HCAPLUS
Batyuk, A	1990		18	Kriobiologija	HCAPLUS
Bazsa, G	1995	57	73	J Inorg Biochem	HCAPLUS
Bruice, T	1964	86	4104	J Am Chem Soc	HCAPLUS
Chao, H	1995	357	183	FEBS Lett	HCAPLUS
Cheng, A	1997	73	2851	Biophys J	HCAPLUS
Concannon, J	1986	43	3027	Am J Hosp Pharm	HCAPLUS
Diehl, H	1933	5	300	Food Indus	HCAPLUS
Dinel, B	1977	11	542	Drug Intell Clin Pha	HCAPLUS
Douzou, P	1979	12	521	Quart Rev Biophys	HCAPLUS
Eigen, M	1958	247	505	Proc Roy Soc Lond A	HCAPLUS
Feller, G	1997	53	830	Cell Mol Life Sci	HCAPLUS
Feller, G	1996	18	189	FEMS Microbiol Rev	HCAPLUS
Fennema, O	1975		397	Water Relations of F	HCAPLUS
Fennema, O	1975		539	Water Relations of F	HCAPLUS
Field, R	1984			Oscillations and Tra	
Fink, A	1976	263	294	Nature	HCAPLUS
Fletcher, G	1998		239	Cold Ocean Physiolog	HCAPLUS
Franck, F	1975	9	137	Proc Faraday Symp Ch	
Franks, F	1995	46	106	Advances in Protein	
Franks, F	1985			Biophysics and Bioch	
Frauenfelder, H	1979	280	558	Nature	HCAPLUS
Goldbeter, A	1976	5	449	Annu Rev Biophys Bio	HCAPLUS
Goldbeter, A	1997			Biochemical Oscillat	
Grant, N	1967	118	292	Arch Biochem Biophys	HCAPLUS
Grant, N	1965	4	1913	Biochemistry	HCAPLUS
Grant, N	1961	83	4476	J Am Chem Soc	HCAPLUS
Grant, N	1962	84	876	J Am Chem Soc	HCAPLUS
Grant, N	1966	88	4071	J Am Chem Soc	HCAPLUS
Grant, N	1966	212	194	Nature	MEDLINE
Grant, N	1965	150	1589	Science	HCAPLUS
Griffith, M	1992	100	593	Plant Physiol	HCAPLUS
Gronwald, W	1996	35	16698	Biochemistry	HCAPLUS
Hansler, M	1996	11	379	Amino Acids	
Hansler, M	1996	2	279	J Peptide Sci	MEDLINE
Harris, J	1992			Poly(-ethylene glyco	
Hatley, R	1986	24	187	Biophys Chem	HCAPLUS
Hervagault, J	1983	131	183	Eur J Biochem	HCAPLUS
Hess, B	1978		409	Frontiers in Physico	HCAPLUS
Hess, B	1997	30	121	Q Rev Biophys	HCAPLUS
Hess, B	1987	12	45	Trends Biochem Sci	HCAPLUS
Hew, C	1992	203	33	Eur J Biochem	HCAPLUS
Hill, J	1991	192	358	Anal Biochem	HCAPLUS
Huber, R	1978	11	114	Acc Chem Res	HCAPLUS
Jakubke, H	1996		53	Molecular Design and	HCAPLUS
Jia, Z	1996	384	285	Nature	HCAPLUS
Kavanau, J	1964		2	Water and Solute Wat	
Landolt-Bornstein	1959	2		Elektrische Eigensch	
Laursen, R	1994	116	12057	J Am Chem Soc	HCAPLUS
Lineweaver, H	1939	61	403	J Am Chem Soc	HCAPLUS

Littlemore, L	1993	185	Peptide Chemistry, P	HCAPLUS
Liu, R	1997	119	J Am Chem Soc	HCAPLUS
Liu, R	1998	28	Origins Life Evol Bi	HCAPLUS
Liu, R	1998	28	Origins Life Evol Bi	HCAPLUS
Loach, P	1970	33	CRC Handbook of Bioc	
Lozano, P	1994	33	Biochem Mol Biol Int	HCAPLUS
Mandelbrot, B	1983		The Fractal Geometry	
Mathias, S	1991	9	Trends Biotechnol	MEDLINE
Meryman, T	1966		Cryobiology	
Michelson, A	1978		Frontiers in Physico	
Nicolis, G	1977		Self-Organization in	
Nilsson, K	1992	16	Biotechnol Appl Bioc	HCAPLUS
Ozaki, S	1998	120	J Am Chem Soc	HCAPLUS
Pincock, R	1969	2	Acc Chem Res	HCAPLUS
Pincock, R	1966	88	J Am Chem Soc	HCAPLUS
Reichardt, C	1994	94	Chem Rev	HCAPLUS
Reichardt, C	1988		Solvents and Solvent	
Rey, L	1975	191	Proc R Soc Lond B	MEDLINE
Russell, N	1992		Molecular Biology an	HCAPLUS
Schuster, M	1990	46	Tetrahedron	HCAPLUS
Sergeev, B	1990	35	Cryochemistry - new	
Shija, R	1992	80	Int J Pharm	HCAPLUS
Sicheri, F	1995	375	Nature	HCAPLUS
Sizer, I	1942	7	Food Res	HCAPLUS
Strambini, G	1996	70	Biophys J	HCAPLUS
Tanner, J	1996	35	Biochemistry	HCAPLUS
Thompson, L	1971	19	J Agr Food Chem	HCAPLUS
Tougu, V	1995	1247	Biochim Biophys Acta	HCAPLUS
Ullmann, G	1997	1338	Biochim Biophys Acta	HCAPLUS
Vajda, T	1980	92	Biochim Biophys Res	HCAPLUS
Vajda, T	1986	7	Cryo-Lett	HCAPLUS
Vajda, T	1995	16	Cryo-Lett	HCAPLUS
Vajda, T	1996	17	Cryo-Lett	HCAPLUS
Vajda, T	1998	19	Cryo-Lett	HCAPLUS
Vajda, T	1993	25	Ind J Chem Kinet	HCAPLUS
Vajda, T	1988	20	Int J Chem Kinet	HCAPLUS
Vajda, T	1987	29	J Inorg Biochem	HCAPLUS
Vajda, T	1993	52	J Inorg Biochem	HCAPLUS
Vajda, T	1995	57	J Inorg Biochem	HCAPLUS
Vajda, T	1981	15	J Inorg Chem	HCAPLUS
Vajda, T	1998	4	J Peptide Sci	HCAPLUS
Warren, G	1995		Biol Ice Nucl Its Ap	HCAPLUS
Wen, D	1993	317	FEBS Lett	HCAPLUS
Wharton, D	1998	36	Cryobiology	
Williams-Smith, D	1977	167	Biochem J	HCAPLUS
Winfrey, A	1984	61	J Chem Educ	
Wohlfarth, C	1994		CRC Handbook of Chem	
Woller, P	1993	34	Adv Microb Physiol	
Yang, D	1998	74	Biophys J	HCAPLUS
Yeh, Y	1996	96	Chem Rev	HCAPLUS

L90 ANSWER 21 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1999:705353 HCAPLUS

TI The capacity for supercooling as a criterion of cold tolerance at various developmental stages of yellow mealworm, beetle **Tenebrio molitor**

AU Belous, A. M.; Gulevskii, A. K.; Ryazantsev, V. V.; Zinchenko, A. V.; Relina, L. I.

CS Inst. Probl. Krivobiol. i Kriomed., NAN Ukrayny, Kharkov, Ukraine

SO Dopovid Natsional'noi Akademii Nauk Ukrainskoi (1999), (8), 145-148

CODEN: DNAUFL; ISSN: 1025-6415

PB Prezidiya Natsional'noi Akademii Nauk Ukrainskoi

DT Journal
 LA Russian
 AB The capacity for supercooling in different developmental stages of freeze-avoiding beetle *Tenebrio molitor* is investigated. All the investigated stages (Larvae, pupae, and adults) are found to be able to supercool. This capacity is shown to increase in larvae and adults after preliminary acclimation at subzero temps. These changes are likely to be due to accumulation of antifreeze proteins. The crystallization temperature in acclimated larvae is 7.5°C lower than in control and in acclimated adults is 3.5°C lower. At the same time, supercooling is a necessary but not sufficient criterion of cold tolerance, as a part of insects perishes from cold shock injuring factors. Protecting mechanisms lowering the possibility of lethal anomalies are switched on during cold acclimation.

L90 ANSWER 22 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1999:606290 HCAPLUS
 DN 131:201672
 TI Analysis of ice crystal growth for a crystal surface containing adsorbed antifreeze proteins
 AU Grandum, Svein; Yabe, Akira; Nakagomi, Kazuya; Tanaka, Makoto; Takemura, Fumio; Kobayashi, Yasunori; Frivik, Per-Erling
 CS Institute for Energy Technology, Kjeller, 2027, Norway
 SO Journal of Crystal Growth (1999), 205(3), 382-390
 CODEN: JCRGAE; ISSN: 0022-0248
 PB Elsevier Science B.V.
 DT Journal
 LA English
 AB The adsorption of antifreeze protein (AFP) mols. to the ice crystal surface during melt growth from an AFP solution results in disturbance of the growth kinetics at the surface interface. In this paper, the growth pattern related to the potential for crystal growth as well as the crystal surface topog. have been studied. The crystal shape and size were strongly dependent on the supercooling in the crystal's surrounding liquid. In between a transition temperature and the freezing temperature, needle-type crystals were formed, growing rapidly in the c-axis direction. The surface was investigated by using a scanning tunneling microscope (STM) and a systematic groove/ridge pattern aligned 65° (± 5°) to the hexagonal side on one bipyramidal plane observed with length and width similar to the size of the AFP mol. The depth of the grooves, ranging from 2-10 nm indicates the curvature of ice.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Chao, H	1995	357	183	FEBS Lett	HCAPLUS
Chou, K	1992	223	509	J Mol Biol	HCAPLUS
Coger, R	1992	205	37	Am Soc Mech Eng HTD	HCAPLUS
Devries, A	1977	495	388	Biophys Acta	HCAPLUS
Grandum, S	1997	11	461	J Thermophys Heat Tr	HCAPLUS
Israelachvili, J	1985			Intermolecular and S	
Jorgensen, H	1993	6	19	Prot Eng	HCAPLUS
Knight, C	1991	59	409	Biophys J	HCAPLUS
Knight, C	1993	64	252	Biophys J	HCAPLUS
Lal, M	1993	95	299	Faraday Discuss	HCAPLUS
Madura, J	1994	116	417	J Am Chem Soc	HCAPLUS
McDonald, S	1995	41	959	A I Ch E J	HCAPLUS
Mori, A	1996	65	2742	J Phys Soc Japan	HCAPLUS
Ogawa, K				Eighth International	
Sicheri, F	1995	375	427	Nature	HCAPLUS
Wen, D	1993	317	31	Fed Euro Biochem Soc	HCAPLUS

Wen, D	1993	268	16401	J Biol Chem	HCAPLUS
Yabe, A	1996	7	193	Ann Rev Heat Transfe	HCAPLUS
Yang, D	1988	333	232	Nature	HCAPLUS

L90 ANSWER 23 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1999:586578 HCAPLUS

DN 132:90645

TI **Antifreeze proteins and their role in plant antifreeze physiology**

AU Jiang, Yong; Jia, Shi-Rong; Fei, Yun-Biao; Tan, Ke-Hui

CS Biotechnology Research Center, Chinese Academy of Agricultural Sciences, Beijing, 100081, Peop. Rep. China

SO Zhiwu Xuebao (1999), 41(7), 677-685

CODEN: CHWHAY; ISSN: 0577-7496

PB Kexue Chubanshe

DT Journal; General Review

LA Chinese

AB A review with 85 refs. on the structure, function, and action mechanism of the **antifreeze proteins**. In the last 3 decades, **antifreeze proteins (AFPs)** have been studied in overwintering insects, polar fish, then in plant materials. The studies in fish **AFPs** were more comprehensive and systematic. Four groups of **AFPs** are identified in the polar fish: AFGPs (**antifreeze glycoproteins**), **AFP I**, **AFP II** and **AFP III**. Two new **AFPs**, THP26/27 (in **Tenebrio molitor**), DAFP-1/-2 (in **Dendroides canadensis**), are purified from insects. Recently, five **AFPs** in plants are purified: Sd67 (in **Solanum dulcamara**), three **antifungal proteins** (in **Secale cereale**) and **afp** (in **Ammonpiptanthus mongolicus**). Their THA (**thermal hysteresis activity**) is lower than that of fish and insect **AFPs**. Plant **AFPs** may have four functions in the **antifreeze** process of plant: (1) lowering the f.p.; (2) inhibiting ice-recrystn.; (3) modifying ice morphol.; (4) regulating the supercooling state of protoplasm. And it is the last one that may be the key role of **AFPs** to benefiate the plant undergoing an **antifreeze** physiol. process.

L90 ANSWER 24 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1999:579883 HCAPLUS

DN 131:189478

TI Purification of highly active **anti-frozen protein from plants**

IN Fei, Yunbiao; Sun, Longhua; Huang, Tao; Shu, Nianhong; Gao, Sujing; Zhao, Shuhui; Jian, Lingcheng

PA Institute of Developmental Biology, Chinese Academy of Sciences, Peop. Rep. China

SO Faming Zhuanli Shenqing Gongkai Shuomingshu, 18 pp.

CODEN: CNXXEV

DT Patent

LA Chinese

FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI CN 1117497	A	19960228	CN 1994-115012	19940824 <--
PRAI CN 1994-115012		19940824	<--	

AB The title **protein** for use as **anti-frozen** agent or cosmetic or food additive is separated from a **cold** -resistant **plant** by homogenizing with a **solution** containing Tris-HCl 1.5-3.0 mM, KCl 0.1 M, EDTA 0.1 mM, mercaptoethanol 5 mM, and PMSF 1 mM, treating with ammonium chloride to obtain a supernatant and purifying on DE-52 and Sephadex G100 columns.

L90 ANSWER 25 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1999:503159 HCAPLUS
 DN 131:282885
 TI A Complex Family of Highly Heterogeneous and Internally Repetitive Hyperactive Antifreeze Proteins from the Beetle *Tenebrio molitor*
 AU Liou, Yih-Cherng; Thibault, Pierre; Walker, Virginia K.; Davies, Peter L.; Graham, Laurie A.
 CS Departments of Biochemistry and Biology, Queen's University, Kingston, ON, K7L 1N6, Can.
 SO Biochemistry (1999), 38(35), 11415-11424
 CODEN: BICHAW; ISSN: 0006-2960
 PB American Chemical Society
 DT Journal
 LA English
 AB The authors have previously identified a Thr- and Cys-rich **thermal hysteresis (antifreeze) protein (THP)** in the beetle *Tenebrio molitor* that has 10-100 times the f.p. depression activity of fish **antifreeze proteins**. Because this 8.4 kDa protein is significantly different in its properties from **THP** preps. previously reported from this insect, a thorough search was undertaken for other **antifreeze** types. Many active **proteins** were observed, but all appeared to be isoforms of the **THP** that differed in their number of 12-amino acid repeats (consensus sequence CTxSxxCxxAxT), amino acid substitutions, and N-linked glycosylation. Mass spectral anal. has matched most of these isoforms with cDNA sequences of 17 different clones from a larval fat body library that encode eight different mature **THPs** containing 84, 96, or 120 amino acids. Genomic Southern blots suggest there may be 30-50 tightly linked copies of the gene, which is a signature consistently seen with unrelated fish **antifreeze protein** genes, and one that has been associated with the need to rapidly increase gene product in response to climate change. A three-dimensional model is proposed for the fully disulfide-bonded structure of *T. molitor* **THP**, which can accommodate addition or deletion of 12-amino acid repeats. The structure is a β -helix that places most of the Thr in a regular array on one side of the **protein** to form a putative ice-binding surface.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Altschul, S	1997	25	3389	Nucleic Acids Res	HCAPLUS
Ashburner, M	1989			Drosophila: A Laborat	
Bateman, K	1998	794	327	J Chromatogr A	HCAPLUS
Bjellqvist, B	1994	15	529	Electrophoresis	HCAPLUS
Burcham, T	1986	261	6384	J Biol Chem	HCAPLUS
Chakrabartty, A	1991	202	1057	Eur J Biochem	HCAPLUS
Chao, H	1994	3	1760	Protein Sci	HCAPLUS
Chao, H	1996	5	1150	Protein Sci	HCAPLUS
Chen, L	1997	94	3811	Proc Natl Acad Sci U	HCAPLUS
Cotton, R	1929	95	1	Tech Bull U.S Dep Ag	
Davies, P	1997	7	828	Curr Opin Struct Bio	HCAPLUS
Duman, J	1998	168	225	J Comp Physiol B	HCAPLUS
Gourlie, B	1984	259	14960	J Biol Chem	HCAPLUS
Graham, L	1996	18	296	Dev Genet	HCAPLUS
Graham, L	1996	26	127	Insect Biochem Mol	HCAPLUS
Graham, L	1997	388	727	Nature	HCAPLUS
Grimstone, A	1968	253	343	Philos Trans R Soc L	
Hansen, T	1988	957	217	Biochim Biophys Acta	HCAPLUS
Hayes, P	1989	264	18761	J Biol Chem	HCAPLUS
Hew, C	1988	263	12049	J Biol Chem	HCAPLUS
Horwath, K	1996	93	419	Eur J Entomol	HCAPLUS
Johnston, S	1990	27	562	Cryobiology	

Klug, A	1995	9	597	FASEB J	HCAPLUS
Knight, C	1991	59	409	Biophys J	HCAPLUS
Kroeker, E	1989			Ph.D Thesis, Queen's	
Kubelka, V	1994	308	148	Arch Biochem Biophys	MEDLINE
Lee, M	1990	10	4506	Mol Cell Biol	HCAPLUS
Li, N	1998	37	6343	Biochemistry	HCAPLUS
Li, N	1998	201	2243	J Exp Biol	HCAPLUS
Morris, H	1996	10	889	Rapid Commun Mass Sp	HCAPLUS
Patterson, J	1978	74	37	J Exp Biol	
Patterson, J	1979	210	361	J Exp Zool	HCAPLUS
Patterson, J	1982	219	381	J Exp Zool	HCAPLUS
Pohl, T	1991	88	10059	Proc Natl Acad Sci U	HCAPLUS
Ramsey, J	1964	248	279	Philos Trans R Soc L	
Schneppenheim, R	1980	67	561	Comp Biochem Phys B	
Scott, G	1986	43	1028	Can J Fish Aquat Sci	
Scott, G	1988	27	29	J Mol Evol	HCAPLUS
Scott, G	1988	8	3670	Mol Cell Biol	HCAPLUS
Scott, G	1985	82	2613	Proc Natl Acad Sci	HCAPLUS
Sonnichsen, F	1995	4	460	Protein Sci	HCAPLUS
Tang, W	1993			Ph.D Thesis, State U	
Tomchaney, A	1982	21	716	Biochemistry	HCAPLUS
Tyshenko, M	1997	15	887	Nat Biotechnol	HCAPLUS
Von Heijne, G	1986	14	4683	Nucleic Acids Res	HCAPLUS
Worrall, D	1998	282	115	Science	HCAPLUS

L90 ANSWER 26 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1999:485334 HCAPLUS

DN 131:177541

TI Driving force for ice crystal growth from AFGP solution

AU Inohara, N.; Furukawa, Y.

CS Inst. Low Temp. Sci., Hokkaido Univ., Japan

SO Nippon Kessho Seicho Gakkaishi (1999), 26(2), 147
CODEN: NKSGDK; ISSN: 0385-6275

PB Nippon Kessho Seicho Gakkai

DT Journal

LA Japanese

AB Ice crystal growth from the AFGP solution was observed in-situ using a directional growth method. Driving force for the ice crystal grown in AFGP solution was directly measured.

L90 ANSWER 27 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1999:369664 HCAPLUS

DN 131:154985

TI Purification, immunolocalization, cryoprotective, and antifreeze activity of PCA60: a dehydrin from peach (Prunus persica)

AU Wisniewski, Michael; Webb, Robert; Balsamo, Ron; Close, Timothy J.; Yu, Xiao-Ming; Griffith, Marilyn

CS USDA-ARS, Kearneysville, WV, 25430, USA

SO Physiologia Plantarum (1999), 105(4), 600-608
CODEN: PHPLAI; ISSN: 0031-9317

PB Munksgaard International Publishers Ltd.

DT Journal

LA English

AB Dehydrins are glycine-rich, hydrophilic, heat-stable proteins and are generally induced in response to a wide array of environmental stresses. In previous research, a full-length dehydrin gene, ppdhn1, was isolated from peach, and its expression was associated with qual. and quant. differences in cold hardiness in sibling genotypes of evergreen and deciduous peach. Similar results were obtained for levels of the corresponding 60 kDa peach dehydrin protein

(PCA60). The objective of the present study was to purify the PCA60, test the purified protein for **cryoprotective** and/or **antifreeze** activity, and to determine the cellular localization of PCA60 using immuno-microscopy. PCA60 was extracted from winter bark tissues of peach (*Prunus persica* [L.] Batsch) and purified in a two-step process. Separation was based on free-solution isoelec. focusing followed by size exclusion. Purified PCA60, as well as crude protein extract, **preserved** the *in vitro* enzymic activity of lactate dehydrogenase after several **freeze-thaw** cycles in liquid nitrogen. PCA also exhibited distinct **antifreeze** activity as evidenced by **ice crystal morphol.** and **thermal hysteresis.** This is the first time **antifreeze** activity has been demonstrated for dehydrins. Immuno-microscopy, utilizing an affinity-purified, polyclonal antibody developed against a synthetic **peptide** of the lysine-rich consensus portion of dehydrins, indicated that PCA60 was freely distributed in the cytoplasm, plastids, and nucleus of bark cells and xylem parenchyma cells. Although the functional role of dehydrins remains speculative, the data support the hypothesis that it plays a role in preventing denaturation of **proteins** exposed to dehydrative stresses.

RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (RWK)	Referenced File
Arora, R	1996	31	923	Hort Sci	HCAPLUS
Arora, R	1994	105	95	Plant Physiol	HCAPLUS
Artlip, T	1997	122	784	J Am Soc Hort Sci	
Artlip, T	1997	33	61	Plant Mol Biol	HCAPLUS
Artus, N	1996	93	13404	Proc Natl Acad Sci U	HCAPLUS
Asghar, R	1994	177	87	Protoplasma	HCAPLUS
Cai, Q	1995	29	11	Plant Mol Biol	HCAPLUS
Campbell, S	1997	137	61	New Phytol	HCAPLUS
Caple, G	1996	11	299	J Colloid Interf Sci	
Carpenter, J	1988	25	244	Cryobiology	HCAPLUS
Ceccardi, T	1994	5	266	Protein Exp Purif	HCAPLUS
Close, T	1996	97	795	Physiol Plant	HCAPLUS
Close, T	1997	100	291	Physiol Plant	HCAPLUS
Close, T	1993	23	279	Plant Mol Biol	HCAPLUS
Danyluk, J	1998	10	623	Plant Cell	HCAPLUS
Davies, P	1990	4	2460	FASEB J	HCAPLUS
De Vries, A	1986	127	293	Methods Enzymol	HCAPLUS
Duman, J	1993	2	131	Adv Low-Temp Biol	
Duman, J	1994	1206	129	Biochim Biophys Acta	HCAPLUS
Dure, L	1993		91	Response of Plants t	HCAPLUS
Egerton-Warburton, L	1997	101	545	Physiol Plant	HCAPLUS
Godoy, J	1994	26	1921	Plant Mol Biol	HCAPLUS
Gong, Z	1996	271	4106	J Biol Chem	HCAPLUS
Hew, C	1992	203	33	Eur J Biochem	HCAPLUS
Hon, W	1994	104	271	Plant Physiol	
Hon, W	1995	109	879	Plant Physiol	HCAPLUS
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Kazuuoka, T	1994	35	601	Plant Cell Physiol	
Lin, C	1992	183	1103	Biochem Biophys Res	HCAPLUS
Mayhew	1996		922	Escherichia coli Salm	
Muthalif, M	1994	104	1439	Plant Physiol	HCAPLUS
Neuhoff, V	1988	9	255	Electrophoresis	HCAPLUS
Neven, L	1992	99	1362	Plant Physiol	HCAPLUS
Parody-Morreale, A	1988	33	782	Nature	
Pihakaski-Maunsbach, K	1996	191	115	Protoplasma	HCAPLUS
Ramagl, L	1985	6	559	Electrophoresis	
Schneider, K	1993	189	120	Planta	HCAPLUS
Valerio, P	1992	164	135	J Exp Biol	
Wisniewski, M	1996	96	496	Physiol Plant	HCAPLUS

Wisniewski, M	1995	9	253	Trees	
Zamecnik, J	1992	29	718	Cryobiology	

L90 ANSWER 28 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1999:217462 HCAPLUS
 DN 131:128417
 TI An in Vivo Study of **Antifreeze Protein** Adjuvant
Cryosurgery
 AU Pham, Linda; Dahiya, Rajvir; Rubinsky, Boris
 CS Bioengineering Laboratory, Department of Mechanical Engineering,
 University of California, Berkeley, CA, 94720, USA
 SO Cryobiology (1999), 38(2), 169-175
 CODEN: CRYBAS; ISSN: 0011-2240
 PB Academic Press
 DT Journal
 LA English
 AB **Cryosurgery** employs **freezing** to destroy undesirable tissue. However, under certain **thermal** conditions, **frozen** tissues survive. The survival of **frozen** undesirable tissue may lead to complications, such as recurrence of cancer. In a study of nude mice with s.c. metastatic prostate tumors, we showed that the preoperative injection of a phosphate-buffered saline solution with 10 mg/mL **antifreeze protein** of type I into the tumor prior to **freezing** enhances destruction under **thermal** conditions which normally yield cell survival. This suggests that the adjunctive use of **antifreeze proteins** in **cryosurgery** may reduce the complications from undesirable tissues that survive **freezing**. (c) 1999 Academic Press.

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Arnott, J	1851			On the Treatment of	
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Cooper, T	1970	7	189	Cryobiology	
Koushafar, H	1997	49	421	Urology	MEDLINE
Koushafar, S	1997	66	114	J Surg Oncol	
Mazur, P	1970	168	939	Science	MEDLINE
Onik, G	1984	21	321	Cryobiology	MEDLINE
Rubinsky, B	1984	21	303	Cryobiology	MEDLINE
Rubinsky, B	1989	26	580	Cryobiology	
Rubinsky, B	1993	30	191	Cryobiology	MEDLINE
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Sicheri, F	1995	375	427	Nature	HCAPLUS
Tatsutani, K	1996	48	441	Urology	MEDLINE
Yeh, Y	1996	96	601	Chem Rev	HCAPLUS

L90 ANSWER 29 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1999:34995 HCAPLUS
 DN 130:120468
 TI Properties and uses of **Tenebrio molitor**
thermal hysteresis (antifreeze)
proteins (THP)
 IN Graham, Laurie A.; Liou, Yih-cherng; Walker, Virginia K.; Davies, Peter L.
 PA Queen's University At Kingston, Can.
 SO PCT Int. Appl., 88 pp.
 CODEN: PIXXD2
 DT Patent
 LA English
 FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI WO 9900493	A1	19990107	WO 1998-CA618	19980625 <--

W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM
RW: GH, GM, KE, LS, MW, SD, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG

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AU 9880970 A1 19990119 AU 1998-80970 19980625 <--
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R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI
JP 2002507889 T2 20020312 JP 1999-505174 19980625 <--
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WO 1998-CA618 W 19980625 <--

AB **Thermal hysteresis (antifreeze) proteins** (THP) that have up to 100 times the specific activity of fish antifreeze proteins have been isolated and purified from the common yellow mealworm beetle, **Tenebrio molitor**. **Tenebrio molitor** is a freeze-tolerant pest of stored grains in temperate regions, and it is the **thermal hysteresis** activity of their hemolymph that allows the insects to depress their f.ps. in the presence of ice or ice nucleators. Internal sequencing of the **proteins**, leading to cDNA cloning and production of the **protein** in bacteria, has confirmed the identity and activity of the 8.4 to 10.7 kDa THP. THPs are Thr- and Cys-rich **proteins** composed largely of 12-amino-acid repeats of Cys-Thr-Xaa-Ser-Xaa-Xaa-Cys-Xaa-Ala-Xaa-Thr. At a concentration of 55 µg/mL, the THP depressed the f.p. 1.6 °C below the m.p., and at a concentration of .apprx.1 mg/mL the THP or its variants can account for the 5.5 °C of **thermal hysteresis** found in **Tenebrio** larvae. THPs function by an absorption-inhibition mechanism and produce oval-shaped ice crystals with curved prism faces. The purified, expressed THP **protein** can be directly added to an aqueous solution to depress the f.p., or transformed organisms expressing THP can be added to items which will be stored frozen. It is thus suggested that THP can be used for new techniques and compns. suitable for improving the preservation characteristics of organic materials at low temps., including storage of frozen foods, drugs, plasma, cells, plants, etc.

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Graham, L	1997	388	727	Nature	HCAPLUS
Heman, C	1994	3	1760	Protein Science	
Patterson, J	1982	219	381	J Exp Zool	HCAPLUS
Schneppenheim, R	1980	67B	561	Comp Biochem Physiol	HCAPLUS
Tomchaney, A	1982	21	716	Biochemistry	HCAPLUS
University of Notre Dam	1996			WO 9640973 A	HCAPLUS

L90 ANSWER 30 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1998:721241 HCAPLUS

DN 130:45468

TI Crystallization of ice in aqueous solutions of glycerol and dimethyl sulfoxide 2. Ice crystal growth kinetics

AU Hey, J. M.; MacFarlane, D. R.
 CS Department of Chemistry, Monash University, Clayton, 3168, Australia
 SO Cryobiology (1998), 37(2), 119-130
 CODEN: CRYBAS; ISSN: 0011-2240
 PB Academic Press
 DT Journal
 LA English
 AB The crystallization of ice in aqueous solns. of glycerol and DMSO (Me₂SO) was studied using a combined DSC-video microscope technique. The solns. studied were 50 weight/weight% glycerol and 45 weight/weight% Me₂SO; both of these solns. have a solute concentration of .apprx.16 mol%. The rates of growth of the external surfaces of ice crystals from both of these solns. were determined over broad temperature ranges. The growth rates are generally independent of time, particularly at lower temps. The ice crystal growth rate in the glycerol solution became negligible at a significantly higher temperature than in the Me₂SO solution. Addition of antifreeze protein from the winter flounder at concns. of 1.7 and 9.9 mg g⁻¹ has no significant effect on the ice crystal growth rates in 50 weight/weight% glycerol solns. (c)
 1998 Academic Press.

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Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (RWK)	Referenced File
Boutron, P	1978	15	93	Cryobiology	HCAPLUS
Bronshteyn, V	1992	29	782	Cryobiology	
Carpenter, J	1992	89	8953	Proc Natl Acad Sci U S A	HCAPLUS
Chang, Z	1991	12	215	Cryo Lett	HCAPLUS
Christian, J	1965			The Transformations	
DeVries, A	1984	304	575	Phil Trans R Soc Lon	HCAPLUS
DeVries, A	1969	163	1073	Science	HCAPLUS
DeVries, A	1971	172	1152	Science	HCAPLUS
Fahy, G	1995			Biological Ice Nucle	
Forsyth, M	1989			PhD thesis Monash Un	
Hey, J	1996	33	205	Cryobiology	HCAPLUS
Hey, J	1997	211	262	J Non-Cryst Solids	HCAPLUS
Hey, J	1997	49	991	J Therm Anal	HCAPLUS
Luyet, B	1958	8	1	Biodynamica	
Luyet, B	1968	10	167	Biodynamica	
MacFarlane, D	1986	27	228	Phys Chem Glasses	HCAPLUS
Mehl, P	1989	155	187	Thermochim Acta	HCAPLUS
Mehl, P				to be published in C	
Rapatz, G	1966	10	69	Biodynamica	
Raymond, J	1977	74	2589	Proc Natl Acad Sci U S A	HCAPLUS
Saito, Y	1996			Statistical Physics	
Sutton, R	1993	14	13	Cryo Lett	HCAPLUS
Sutton, R	1991	87	101	J Chem Soc Faraday Trans 1	HCAPLUS
Yeh, Y	1978	11	129	Acc Chem Res	HCAPLUS

L90 ANSWER 31 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1998:572198 HCAPLUS

DN 129:327403

TI A study on the growth habits of ice crystal in antifreeze solution

AU Li, Qianzhong; Luo, Liaofo

CS Laboratory of Theoretical Physics and Biology, Physics Department, Inner Mongolia University, Hohhot, 010021, Peop. Rep. China

SO Theoretical Biophysics and Biomathematics, Proceedings of the International Symposium, Hohhot, Peop. Rep. China, June 2-5, 1997 (1997), 108-112. Editor(s): Luo, Liaofo; Li, Qianzhong; Lee, Weijiang. Publisher: Inner Mongolia University Press, Hohhot, Peop. Rep.

China.

CODEN: 66QOA2

DT Conference

LA English

AB The presence of antifreeze polypeptides not only lowers the freezing temperature of a solution but also alters the growth habits and growth rates of ice crystals in the antifreeze polypeptide solns. The mechanism of antifreeze polypeptides is analyzed through a polymeric adsorption model proposed by us. The growth habits and growth rates of ice crystals can be quant. discussed. Theor. results are consistent with exptl. data. This may be useful for a fuller understanding of the mechanism of the antifreeze polypeptides' interactions on the surface of ice crystal that leads to anisotropic crystal growth facets.

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Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (R WK)	Referenced File
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Feeney, R	1994	13	347	J Carbohydrate Chemi	HCAPLUS
Feeney, R	1991	113	417	J Crystal Growth	HCAPLUS
Li, Q	1993	216	453	Chem Phys Lett	HCAPLUS
Li, Q	1994	223	181	Chem Phys Lett	HCAPLUS
Luo, L	1995	54	243	Int J Quantum Chem	HCAPLUS
Schrag, J	1982	717	322	Biochem Biophys Acta	HCAPLUS

L90 ANSWER 32 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1998:571814 HCAPLUS

DN 129:328887

TI Vitrification of mature mouse oocytes in a 6 M Me₂SO solution supplemented with antifreeze glycoproteins: the effect of temperature

AU O'Neil, L.; Paynter, S. J.; Fuller, B. J.; Shaw, R. W.; DeVries, A. L.

CS Department of Obstetrics and Gynaecology, University of Wales College of Medicine, Cardiff, CF4 4XN, UK

SO Cryobiology (1998), 37(1), 59-66

CODEN: CRYBAS; ISSN: 0011-2240

PB Academic Press

DT Journal

LA English

AB Oocytes have been successfully cryopreserved using rapid and slow freezing procedures. However, variability in the success of replicates has limited its practical application. In the present study, mature mouse oocytes were vitrified in 6 M DMSO supplemented with 1 mg/mL antifreeze glycoproteins (AFGP) (solution known as VSD + AFGP) from the blood of Antarctic notothenioid fish. Such AFGPs have been used to protect mammalian cells during hypothermia and cryopreservation. However, the degree of protection afforded is a contentious issue. Stepwise addition of cryoprotectant was performed either at room temperature (19-21°C) or on ice (2-4°C), at the final stage of which oocytes were pipetted into 0.25 mL plastic insemination straws and held in liquid nitrogen vapor at -140°C for 3 min before being plunged into liquid nitrogen. Thawing involved holding the straw in the air for 10 s and then in water at 20°C for 10 s before dilution of the VSD solution with 1 M sucrose. Viability was assessed by in vitro fertilization; results have been quoted as median (range). Statistical analyses were performed using Kruskall-Wallis and Mann-Whitney U tests. Of the oocytes cryopreserved following exposure to VSD + AFGP at room temperature, 78% (0-94%) retained normal morphol. and, of these, 53% (0-100%)

cleaved to two cells. Of these two-cell embryos, 56% (0-100%) went on to develop to blastocyst. The overall percentage development to blastocyst, i.e., number of blastocysts/total number of oocytes treated + 100, was 20% (0-76%). Exposure of oocytes to the VSD + AFGP on ice prior to cryopreservation yielded significantly improved rates of fertilization (94%, 82-100%) and overall development to blastocyst (66%, 24-89%) when compared with oocytes cryopreserved following exposure to the VSD + AFGP at room temperature. Rates of normality (86%, 35-95%) and development to blastocyst (89%, 64-100%) were also improved. Cryopreservation in 6 M DMSO supplemented with 1 mg/mL AFGP resulted in poor rates of survival which were highly variable when exposure to cryoprotective agent (CPA) was performed at room temperature. Lowering the temperature of exposure to CPA prior to cryopreservation resulted in improved viability. (c) 1998 Academic Press.

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Bos-Mikich, A	1995	53	780	Biol Reprod	HCAPLUS
Cooper, A	1996	17	149	Cryo-Lett	
Devries, A	1971	246	305	J Biol Chem	HCAPLUS
Devries, A	1984	304	575	Philos Trans R Soc L	HCAPLUS
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Hays, L	1996	93	6835	Proc Natl Acad Sci U	HCAPLUS
Jutte, N	1987	24	292	Cryobiology	HCAPLUS
Jutte, N	1987	24	403	Cryobiology	MEDLINE
Kasai, M	1992	46	1042	Biol Reprod	HCAPLUS
Kola, I	1988	38	467	Teratology	MEDLINE
Kono, T	1991	28	50	Cryobiology	MEDLINE
Leibo, S	1993	14	133	Cryo-Lett	
Massip, A	1986	7	270	Cryo-Lett	
Mugnano, J	1995	269	R474	Am J Physiol	HCAPLUS
Nakagata, N	1989	87	479	J Reprod Fert	MEDLINE
O'Neil, L	1997	18	17	Cryo-Lett	HCAPLUS
O'Neil, L	1998	19	141	Cryo-Lett	HCAPLUS
O'Neil, L	1997	34	295	Cryobiology	HCAPLUS
Petzel, D	1992	29	782	Cryobiology	
Pickering, S	1990	54	102	Fertil Steril	MEDLINE
Pickering, S	1987	2	207	Hum Reprod	MEDLINE
Rall, W	1985	313	573	Nature	MEDLINE
Rubinsky, B	1990	173	1369	Biochem Biophys Res	HCAPLUS
Rubinsky, B	1991	12	93	Cryo-Lett	
Rubinsky, B	1992	29	69	Cryobiology	HCAPLUS
Shaw, P	1991	29	373	Mol Reprod Dev	MEDLINE
Shaw, P	1992	33	210	Mol Reprod Dev	MEDLINE
Takahashi, T	1986	23	103	Cryobiology	MEDLINE
Trounson, A	1986	46	1	Fertil Steril	MEDLINE
Vincent, C	1992	14	73	Oxford Rev Reprod Bi	MEDLINE
Wang, T	1994	31	185	Cryobiology	HCAPLUS
Wood, M	1993	49	489	Biol Reprod	HCAPLUS

L90 ANSWER 33 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1998:313718 HCAPLUS

DN 129:105659

TI Molecular characterization and sequencing of antifreeze proteins from larvae of the beetle *Dendroides canadensis*

AU Duman, J. G.; Li, N.; Verleye, D.; Goetz, F. W.; Wu, D. W.; Andorfer, C. A.; Benjamin, T.; Parmelee, D. C.

CS Department of Biological Sciences, University of Notre Dame, Notre Dame,

IN, 46556, USA
 SO Journal of Comparative Physiology, B: Biochemical, Systemic, and Environmental Physiology (1998), 168(3), 225-232
 CODEN: JPBPD1; ISSN: 0174-1578
 PB Springer-Verlag
 DT Journal
 LA English
 AB The deduced amino acid sequences of **antifreeze proteins** (AFPs) from larvae of the beetle *Dendroides canadensis* were determined from both complementary DNAs (cDNAs) and from **peptide** sequencing. These consisted of **proteins** with a 25-residue signal peptide and mature **proteins** 83 (Dendroides **antifreeze protein**; DAFP-1) or 84 (DAFP-2) amino acids in length which differed at only two positions. **Peptide** sequencing yielded sequences which overlapped exactly with those of the deduced cDNA sequences of DAFP-1 and DAFP-2, while the partial sequence of another **AFP** (DAFP-3) matched 21 of 28 residues. Seven 12- or 13-mer repeating units are present in these **antifreeze proteins** with a consensus sequence consisting of: Cys-Thr-X3-Ser-X5-X6-Cys-X8-X9-Ala-X11-Thr-X13, where X3 and X11 tend toward charged residues, X5 tends toward threonine or serine, X6 toward asparagine or aspartate, X9 toward asparagine or lysine, and X13 toward alanine in the 13-mers. The most interesting feature of these **proteins** is that throughout the length of the mature **antifreeze proteins** every sixth residue is a cysteine. These sequences are not similar to any of the known fish **AFPs**, but they are similar to **AFPs** from the beetle *Tenebrio molitor*.

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Devries, A	1971	172	1152	Science	HCAPLUS
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Duman, J	1994	1206	129	Biochim Biophys Acta	HCAPLUS
Duman, J	1993	30	322	Cryobiology	
Duman, J	1977	115B	279	J Comp Physiol	
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Duman, J	1980	136	53	J Comp Physiol B	HCAPLUS
Duman, J	1979	25	805	J Insect Physiol	HCAPLUS
Graham, L	1997	388	727	Nature (Lond)	HCAPLUS
Granlie, B	1984	259	14960	J Biol Chem	
Griffith, M	1992		174	Advances in plant co	
Griffith, M	1992	10	593	Plant Physiol	
Hew, C	1983	61	2324	Can J Zool	HCAPLUS
Husby, J	1980	36	963	Experientia	HCAPLUS
Knight, C	1991	59	409	Biophys J	HCAPLUS
Komatsu, S	1970	245	2909	J Biol Chem	HCAPLUS
Lin, Y	1972	46	89	Biochem Biophys Res	
Olsen, T	1997	167	105	J Comp Physiol B	
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Patterson, J	1981	142B	539	J Comp Physiol	
Patterson, J	1979	210	361	J Exp Zool	HCAPLUS
Perlman, D	1983	167	391	J Mol Biol	HCAPLUS

Raymond, J	1977	16	2575	Biopolymers	HCAPLUS
Raymond, J	1977	86	881	Proc Natl Acad Sci U	
Raymond, J	1989	86	881	Proc Natl Acad Sci U	HCAPLUS
Sanger, F	1977	74	5463	Proc Natl Acad Sci U	HCAPLUS
Shier, W	1972	263	406	Biochim Biophys Acta	HCAPLUS
Shier, W	1975	54	135	FEBS Lett	HCAPLUS
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Tomchaney, A	1982	21	716	Biochemistry	HCAPLUS
Tsunasawa, S	1993		45	Methods in protein s	HCAPLUS
Tursman, D	1994	268	347	J Exp Zool	
Tursman, D	1995	272	249	J Exp Zool	HCAPLUS
Tyshenko, M	1997	15	887	Nature Biotechnology	HCAPLUS
Urrutia, M	1992	1121	199	Biochim Biophys Acta	HCAPLUS
Wilson, P	1993	14	31	Cryo Lett	
Wu, D	1991	1076	416	Biochim Biophys Acta	HCAPLUS
Wu, D	1991	161	271	J Comp Physiol	HCAPLUS
Wu, D	1991	161	279	J Comp Physiol	HCAPLUS
Xu, L	1992	101B	105	Comp Biochem Physiol	HCAPLUS
Xu, L	1991	258	288	J Exp Zool	HCAPLUS

L90 ANSWER 34 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1998:100131 HCAPLUS

DN 128:240948

TI Quantitative estimation of the activation energy for ice crystal growth of antifreeze glycoproteins solutions under free growth conditions

AU Li, Qianzhong; Luo, Liaofu

CS Laboratory of Theoretical Physics and Biology, NeiMongol University, Hohhot, 010021, Peop. Rep. China

SO Neimenggu Daxue Xuebao, Ziran Kexueban (1997), 28(4), 505-507
CODEN: NDZKEJ; ISSN: 1000-1638

PB Neimenggu Daxue Xuebao Bianjibu

DT Journal

LA Chinese

AB According to the growth rate of ice crystals, the activation energies for ice crystal growth of antifreeze glycoproteins solution under free growth conditions were calculated

L90 ANSWER 35 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1998:1568 HCAPLUS

DN 128:72167

TI Spruce budworm antifreeze proteins, the genes encoding them and their uses

IN Walker, Virginia K.; Davies, Peter L.; Rahavard, Mitra; Tyshenko, Michael G.

PA Queen's University At Kingston, Can.; Walker, Virginia K.; Davies, Peter L.; Rahavard, Mitra; Tyshenko, Michael G.

SO PCT Int. Appl., 73 pp.
CODEN: PIXXD2

DT Patent

LA English

FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 9746674	A1	19971211	WO 1997-CA371	19970603 <--
	W:	AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM			
	RW:	GH, KE, LS, MW, SD, SZ, UG, AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN,			

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IE, FI

JP 2001505404 T2 20010424 JP 1998-500038 19970603 <--

KR 2000016268 A 20000325 KR 1998-709841 19981203 <--

PRAI US 1996-657264 A2 19960603 <--

WO 1997-CA371 W 19970603 <--

AB A class of **thermal hysteresis, antifreeze proteins (THPs)** has been isolated and purified from *Choristoneura* sp., including the spruce budworm *C. fumiferana*, and the genes encoding them have been cloned. Antibodies have been raised against these **proteins**. The invention also includes a method for decreasing the f.p. of an aqueous **solution** by adding these **antifreeze proteins** to the **solution** that may be of use in preventing **freeze/thaw damage** of **frozen foods**, e.g. **fish**. The **proteins** were purified chromatog. from *Choristoneura* larvae homogenates with purification monitored by measurement of **thermal hysteresis** of fractions. Amino acid sequence-derived primers were used to amplify cDNAs for the **proteins**.

L90 ANSWER 36 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1997:779569 HCPLUS

DN 128:125036

TI **Ice-binding mechanism of winter flounder antifreeze proteins**

AU Cheng, Ailan; Merz, Kenneth M., Jr.

CS Department of Chemistry, The Pennsylvania State University, University Park, PA, 16802, USA

SO Biophysical Journal (1997), 73(6), 2851-2873
CODEN: BIOJAU; ISSN: 0006-3495

PB Biophysical Society

DT Journal

LA English

AB The winter flounder **antifreeze protein (AFP)** and 2 of its mutants were studied using mol. dynamics simulation techniques. The simulations were performed under 4 conditions: in the gas phase, solvated by water, adsorbed on the **ice** (20.hivin.21) **crystal** plane in the gas phase and in aqueous **solution**. This study provided details of the **ice-binding pattern** of the winter flounder **AFP**. Simulation results indicated that the Asp, Asn, and Thr residues in the **AFP** are important in **ice** binding and that Asn and Thr as a group bind cooperatively to the **ice** surface. These **ice-binding residues** can be collected into 4 distinct **ice-binding regions**: Asp-1/Thr-2/Asp-5, Thr-13/Asn-16, Thr-24/Asn-27, and Thr-35/Arg-37. These 4 regions are 11 residues apart and the repeat distance between them matches the **ice** lattice constant along the <.hivin.1102> direction. This match is crucial to ensure that all 4 groups can interact with the **ice** surface simultaneously, thereby, enhancing **ice** binding. These Asx (x = p or n)/Thr regions each form 5-6 H-bonds with the **ice** surface: Asn forms .aprx.3 H-bonds with **ice** mols. located in the step region whereas Thr forms 1-2 H-bonds with the **ice** mols. in the ridge of the (20.hivin.21) **crystal** plane. Both the distance between Thr and Asn and the ordering of the 2 residues are crucial for effective **ice** binding. The proper sequence is necessary to generate a binding surface that is compatible with the **ice** surface topol., thus providing a perfect "host/guest" interaction that simultaneously satisfies both

H-bonding and van der Waals interactions. The results also show the relation among binding energy, the number of H-bonds, and the activity. The activity is correlated to the binding energy, and in the case of the mutants the authors studied the number of H-bonds. The greater the number of the H-bonds, the greater the antifreeze activity. The roles of van der Waals interactions and the hydrophobic effect play in ice binding are also highlighted. For the latter it is demonstrated that the surface of ice has a clathrate-like structure which favors the partitioning of hydrophobic groups to the surface of ice. It is suggested that mutations that involve the deletion of hydrophobic residues (e.g., the Leu residues) will provide insight into the role the hydrophobic effect plays in partitioning these peptides to the surface of ice.

RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R VL)	PG (R PG)	Referenced Work (RWK)	Referenced File
Ananthanarayanan, V	1989	7	1	Life Chem Rep	HCAPLUS
Arav, A	1993	36	488	Mol Reprod Dev	HCAPLUS
Bash, P	1987	236	564	Science (Washington)	HCAPLUS
Berendsen, H	1984	81	3684	J Chem Phys	HCAPLUS
Burcham, T	1984	139	197	Anal Biochem	HCAPLUS
Chakrabartty, A	1989	264	11307	J Biol Chem	HCAPLUS
Chakrabartty, A	1989	264	11313	J Biol Chem	HCAPLUS
Cheng, A	1996	100	1927	J Phys Chem	HCAPLUS
Chou, K	1992	223	509	J Mol Biol	HCAPLUS
Creighton, T	1993			Protein Structures a	
Davies, P	1990	4	2460	FASEB J	HCAPLUS
Devries, A	1970	245	2901	J Biol Chem	HCAPLUS
Feeney, R	1986	15	59	Annu Rev Biophys Bio	HCAPLUS
Feeney, R	1993		82	Food Technol	
Hansen, T	1993	64	1843	Biophys J	HCAPLUS
Hays, L	1993	64	296a	Biophys J	
Hew, C	1986	160	267	Eur J Biochem	HCAPLUS
Jia, Z	1996	384	285	Nature	HCAPLUS
Jorgensen, H	1993	6	19	Protein Engin	HCAPLUS
Jorgensen, W	1983	79	926	J Chem Phys	HCAPLUS
Karim, O	1988	89	6889	J Chem Phys	HCAPLUS
Kenward, K	1993	23	377	Plant Mol Biol	HCAPLUS
Kerr, W	1987	85	449	J Cryst Growth	HCAPLUS
Knight, C	1991	59	409	Biophys J	HCAPLUS
Knight, C	1984	308	295	Nature	HCAPLUS
Lal, M	1993	95	299	Faraday Discuss	HCAPLUS
Madura, J	1994	116	417	J Am Chem Soc	HCAPLUS
McDonald, S	1993	33	1481	Biopolymers	HCAPLUS
Myers, J	1996	71	2033	Biophys J	HCAPLUS
Pain, R	1988	333	207	Nature	MEDLINE
Pearlman, D	1991			AMBER 4.0	
Raymond, J	1977	74	2589	Proc Natl Acad Sci U	HCAPLUS
Rossky, P	1979	101	1913	J Am Chem Soc	HCAPLUS
Ryckaert, J	1977	23	327	J Comput Phys	HCAPLUS
Sicheri, F	1995	375	427	Nature	HCAPLUS
Sonnichsen, F	1996	4	1325	Structure	MEDLINE
Swaminathan, S	1978	100	5705	J Am Chem Soc	HCAPLUS
Teeter, M	1984	81	6014	Proc Natl Acad Sci U	HCAPLUS
Tirado-Rives, J	1990	112	2773	J Am Chem Soc	HCAPLUS
Weiner, S	1984	106	765	J Am Chem Soc	HCAPLUS
Wen, D	1992	63	1659	Biophys J	HCAPLUS
Wen, D	1993	317	31	FEBS Lett	HCAPLUS
Wen, D	1992	267	14102	J Biol Chem	HCAPLUS
Wyckoff, R	1969			Crystal Structures	
Yang, D	1988	333	232	Nature	HCAPLUS
Yeh, Y	1996	96	601	Chem Rev	HCAPLUS

L90 ANSWER 37 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1997:726499 HCAPLUS
 DN 128:2477
 TI Chemical adjuvant **cryosurgery** with **antifreeze proteins**
 AU Koushafar, H.; Pham, L.; Lee, C.; Rubinsky, Boris
 CS Biomed. Engineering lab., Dep. of Mech. Eng., Univ. of California, Berkeley, CA, 94720, USA
 SO Journal of Surgical Oncology (1997), 66(2), 114-121
 CODEN: JSONAU; ISSN: 0022-4790
 PB Wiley-Liss
 DT Journal
 LA English
 AB Imaging monitored **cryosurgery** is emerging as an important minimally invasive surgical technique for treatment of cancer. Although imaging allows excellent control over the process of **freezing** itself, recent studies show that at high subzero temps. cells survive **freezing**. **Antifreeze proteins (AFP)** are chemical compds. that modify **ice crystals** to needle-like shapes that can destroy cells in cellular suspensions. The goal of this study was to determine whether these **antifreeze proteins** can also destroy cells in **frozen** tissue and serve as chemical adjuvants to **cryosurgery**. Livers from six rats were excised, perfused with solns. of either phosphate-buffered saline (PBS) or PBS with 10 mg/mL AFP-I, and **frozen** with a special **cryosurgery** apparatus. Lobes were **frozen** with one or two **freeze-thaw** cycles and the cell viability was examined with a two stain fluorescent dye test and histol. assessment. A significant percentage of hepatocytes survive **freezing** on the margin of a **frozen** **cryolesion**. **AFP** increase cellular destruction in that region apparently through formation of intracellular **ice**. Thus, **antifreeze proteins** may be effective chemical adjuvants to **cryosurgery**.

RETABLE

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Arnott, J	1845			On the present state	
Coger, R	1994	116	173	J Offsh Mech Arc Res	
Ishiguro, H	1994	31	483	Cryobiology	MEDLINE
Koushafar, H	1997	49	421	Urology	MEDLINE
Larese, A	1996	17	175	Cryoletters	HCAPLUS
Mazur, P	1970	68	939	Science	
Merryman, M	1966			Cryobiology	
Mugnano, J	1995	269	R474	Am J Physiol	HCAPLUS
Onik, G	1991	67	901	Cancer	MEDLINE
Onik, G	1993	72	1291	Cancer	MEDLINE
Onik, G	1984	21	321	Cryobiology	MEDLINE
Pease, G	1995	117	59	J Biomech Eng ASME T	MEDLINE
Pease, G	1995	5/6	753	J Magn Reson Imaging	
Raymond, J	1977	74	2589	Proc Natl Acad Sci U	HCAPLUS
Rivoire, M	1969	61	242	J Surg Oncol	
Rubinsky, B	1985	22	55	Cryobiology	
Rubinsky, B	1989	26	580	Cryobiology	
Rubinsky, B	1993	30	191	Cryobiology	MEDLINE
Rubinsky, B	1978	100	300	J Heat Transf ASME T	
Rubinsky, B	1986	108	48	Mech Eng	
Rubinsky, B	1988	234	343	Proc R Soc Lond [Bio	MEDLINE
Tatsutani, K	1996	48	441	Urology	MEDLINE

AN 1997:674903 HCPLUS
 DN 127:328027
 TI Vapor pressure of aqueous **antifreeze glycopeptide solutions**
 AU Westh, Peter; Ramlov, Hans; Wilson, Peter W.; DeVries, Arthur L.
 CS Department of Life Sciences and Chemistry, Roskilde University, Roskilde, DK-4000, Den.
 SO Cryo-Letters (1997), 18(5), 277-282
 CODEN: CRLED9; ISSN: 0143-2044
 PB Cryo-Letters
 DT Journal
 LA English
 AB Measurements are reported of the vapor pressure of liquid, partially frozen, and frozen aqueous solns. of antifreeze glycopeptides at temps. ranging from -1 to 0 °C. Results indicate that at a given temperature, the activity of water in liquid or partially frozen (ca. 5% ice content) solns. is approx. the same as the activity of pure supercooled water. In a completely frozen solution, on the other hand, water activity is equal to that of pure ice. The data show that the antifreeze peptides only affect bulk properties of liquid as well as frozen solns. to a very limited extent, and, thus, provide direct evidence that the inhibiting effect of these mols. on ice formation is an entirely kinetic (non-equilibrium) phenomenon.

L90 ANSWER 39 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1997:565551 HCPLUS
 DN 127:275629
 TI Hyperactive antifreeze protein from beetles
 AU Graham, Laurie A.; Liou, Yih-Cherng; Walker, Virginia K.; Davies, Peter L.
 CS Dep. Biochem. Biol., Queen's Univ., Kingston, ON, K7L 1N6, Can.
 SO Nature (London) (1997), 388(6644), 727-728
 CODEN: NATUAS; ISSN: 0028-0836
 PB Macmillan Magazines
 DT Journal
 LA English
 AB The authors have purified and cloned 4 **thermal hysteresis proteins** from a fat body cDNA library which possess up to 100-times the specific activity of fish antifreeze proteins from the common yellow mealworm beetle **Tenebrio Molitor**. The proteins are threonine and cysteine rich, of relative mol. mass 8,400, composed largely of 12-amino acid repeats. It's estimated that a concentration of 1 mg/mL of this protein can account for the 5.5°C of thermal hysteresis found in **Tenebrio Molitor**.

RETABLE

Referenced Author (RAU)	Year (R PY)	VOL (R V L)	PG (R P G)	Referenced Work (R W K)	Referenced File
Davies, P	1990	4	2460	FASEB J	HCPLUS
Devries, A	1983	45	245	Annu Rev Physiol	HCPLUS
Grimstone, A	1968	253	343	Phil Trans R Soc Lon	
Horwath, K	1996	93	419	Eur J Entomol	HCPLUS
Knight, C	1991	59	409	Biophys J	HCPLUS
Patterson, J	1982	219	381	J Exp Zool	HCPLUS
Schneppenbeim, R	1980	67	561	Comp Biochem Physiol	
Sonnichsen, F	1995	4	460	Prot Sci	HCPLUS
Tomchaney, A	1982	21	716	Biochemistry	HCPLUS
Wilson, P	1993	14	31	Cryo-Letters	
Wishart, D	1994	10	121	Comput Appl Biosci	HCPLUS

AN 1997:529059 HCPLUS
 DN 127:192333
 TI Ice slurry made from an **antifreeze protein**
solution for ice storage applications
 AU Grandum, S.; Yabe, A.; Nakagomi, K.; Tanaka, M.; Takemura, F.; Kobayashi, Y.; Frivik, P. E.
 CS Institute of Engineering Mechanics, University of Tsukuba, Japan
 SO Proceedings - International Congress of Refrigeration, 19th, The Hague, Aug. 20-25, 1995 (1995), Volume 3A, 86-90 Publisher: Institut International du Froid, Paris, Fr.
 CODEN: 64VHAQ
 DT Conference
 LA English
 AB The influence of **antifreeze proteins (AFPs)** on the growth of **ice crystal** was studied for the purpose of utilizing the resulting flowable **ice** slurry in **cold heat storage** applications. Important parameters like **storage** ability and **flowability** was exptl. studied for various concns. of the **protein** in the water **solution** In the temperature range down to -1°, most of the latent **heat** is accumulated in the **crystal** slurry, indicating that the temperature of the flowable **ice** slurry should be from this value above. Such a temperature dependency description is given.

L90 ANSWER 41 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1997:527762 HCPLUS

DN 127:195492

TI Tissue destruction in **cryosurgery** by use of **thermal hysteresis**

IN Rubinsky, Boris; Koushafar, Amir-Homayoon

PA Regents of the University of California, USA

SO U.S., 7 pp.

CODEN: USXXAM

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 5654279	A	19970805	US 1996-625074	19960329 <--
	JP 20000507864	T2	20000627	JP 1997-535430	19970326 <--
	IL 125981	A1	20020210	IL 1997-125981	19970326 <--

PRAI US 1996-625074 A 19960329 <--
 WO 1997-US5028 W 19970326 <--

AB Cell and tissue destruction by **cryoablation** is enhanced by perfusion of the cells with **thermal hysteresis** **proteins** (e.g. **antifreeze proteins** and **glycoproteins** of **fish**) prior to **cryogenic** **freezing**. The **proteins** promote the growth of **spicular ice crystals** in the **intracellular** fluid, which destroy the cell by piercing the cell membrane. This decreases the incidence of **cell preservation** by **freezing**, thereby permitting a more uniform and controllable destruction of undesirable tissue by **cryoablation**. Thus, human prostate cancer tissue slices frozen in saline **solution** containing *Pleuronectes americanus* **thermal hysteresis protein** (mol. weight 3600) and thawed showed complete cell destruction, whereas cell destruction was only partial after freezing in the absence of the **thermal hysteresis protein**.

L90 ANSWER 42 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1997:481501 HCPLUS

DN 127:159302

TI Crystallization of water **solutions** of

AU antifreezes from fishes and amphipods
 AU Andreev, A. A.; Pertopavlov, N. N.
 CS Russian Acad. Sci., Institute Cell Biophysics, Pushchino, Russia
 SO Biofizika (1996), 41(6), 1294-1297
 CODEN: BIOFAI; ISSN: 0006-3029
 PB Nauka
 DT Journal
 LA Russian
 AB A comparative anal. of two types of **cryoprotectants**,
antifreeze glycoproteins from Atlantic cod (*Gadus morhua*) and carbohydrates from hemolymph of amphipod crustacean (*Gammarus lacustris*) has been performed. Both **glycoprotein** and carbohydrate **antifreezes** effectively decreased the f.p. of water solns. and diminished the size of **ice crystals** formed. Noncolligative and colligative mechanisms of action are characteristic correspondingly for **glycoproteins** and carbohydrates.

L90 ANSWER 43 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1997:468862 HCPLUS
 DN 127:193037
 TI Characteristics of ice slurry containing **antifreeze protein** for **ice storage** applications
 AU Grandum, Svein; Yabe, Akira; Tanaka, Makoto; Takemura, Fumio; Nakagomi, Kazuya
 CS University of Tsukuba, Tsukuba, 305, Japan
 SO Journal of Thermophysics and Heat Transfer (1997), 11(3), 461-466
 CODEN: JTHTEO; ISSN: 0887-8722
 PB American Institute of Aeronautics and Astronautics
 DT Journal
 LA English
 AB For the development of flowable ice for **storage** and long distance transportation purposes that is resistant to **recrystn.** and contains defined **crystal** structures the characteristics of an **ice slurry** generated from an **antifreeze protein** solution have been examined. Three methods for obtaining the **antifreeze protein** are described. In **crystal** growth studies it has been shown that controlling the supercooling is important to generate the desired needle-type **crystals**, coming from an effective adsorption of **antifreeze proteins** to the **ice** surface. The **ice slurry's thermal storage** ability is found using a differential scanning calorimeter. Furthermore, the slurry flowability is examined using both a capillary tube viscometer and a test loop, the latter is used for comparison of the pressure drop with liquid pure water as well as for the visualization of the slurry flow. For an **ice** content of 30%, the pressure drop in a 6-mm in diameter tube at 1 m/s flow is found to be twice the value for liquid pure water.

L90 ANSWER 44 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1997:300392 HCPLUS
 DN 126:273798
 TI Microscale analysis of **crystals** in **ice slurry** made from an **antifreeze protein** solution
 AU Grandum, Svein; Yabe, Akira; Nakagomi, Kazuya; Tanaka, Makoto; Takemura, Fumio; Kobayashi, Yasunori; Frivik, Per-Erling
 CS Ind. Technology Res. Inst., Japan
 SO Nippon Kikai Gakkai Ronbunshu, B-hen (1997), 63(607), 1029-1034
 CODEN: NKGBDD; ISSN: 0387-5016
 PB Nippon Kikai Gakkai
 DT Journal
 LA Japanese

AB In order to clarify the crystal growth mechanism and to realize the low-temperature heat transportation system of ice slurry made from an antifreeze protein (AFP) solution which consists of ice crystals resistant to recrystn., a fundamental and microscale anal. has been conducted on the ice crystals. Since the thermophys. properties of ice slurry used for ice storage applications, such as energy storage ability and flowability, depend on the shape and size of individual crystals, crystal growth patterns were exptly. investigated by changing the local supercooling temperature while neglecting the influence of heat flux. At low temps., when supercooling exceeded a certain transition value, dendritic crystals were generated, which were apparently unaffected by the existence of AFP. In between the transition temperature and the f.p., needle-like crystals were observed to grow rapidly in the c-axis direction. If these needle-like crystals were held at temps. within the hysteresis gap (between the freezing and the m.p.), bipyramidal crystals within a maximum tip angle of approx. 30° were formed. Since protein adsorption to the ice crystal surface will strongly affect the crystal growth, the surface of crystals was investigated by using a Scanning Tunneling Microscope (STM) in order to determine the influence of AFP on the microscale surface structure. A systematic groove/ridge pattern that was aligned 60° ($\pm 5^\circ$) to the hexagonal side on one bipyramidal plane was observed. The grooves' length and width were similar to the length and width of AFP, indicating adsorption of single protein mols. to ice with an orientation corresponding to the alignment angle. Their depth, ranging from 2 nm to 10 nm, gives information about the surface curvature. Knowledge from microscale anal. can be used in order to create cost-effective artificial additives for ice slurry systems.

L90 ANSWER 45 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1997:233164 HCPLUS
 DN 126:262012
 TI Tracking the profile of a specific antifreeze protein and its contribution to the thermal hysteresis activity in cold hardy insects
 AU Horwath, Kathleen L.; Easton, Christopher M.; Poggioli, George J., Jr.; Myers, Kevin; Schnorr, Ingrid L.
 CS Department of Biological Sciences, Binghamton University, Binghamton, NY, 13902-6000, USA
 SO European Journal of Entomology (1996), 93(3), 419-433
 CODEN: EJENE2; ISSN: 1210-5759
 PB Czech Academy of Sciences, Institute of Entomology
 DT Journal
 LA English
 AB This study summarizes some important new directions in research on antifreeze protein biosynthesis and regulation. It describes the recent development and availability of essential biochem. and cellular tools that make possible more direct cellular investigations, and an assessment of the relation between thermal hysteresis protein (THP) levels and antifreeze activity (both thermal hysteresis and recrystn. inhibition [RI]). These tools include: the isolation of a specific THP of high activity (designated Tm 12.86), and an addnl. endogenous activating factor of this antifreeze protein; the ability to track the cellular and secretory patterns of Tm 12.86 immunol.; the use of an in vitro fat body cell culture system for direct investigation of cellular events, and,

a means of quantifying RI behavior of purified Tm 12.86, and samples of unknown concns. of THPs, to provide a more sensitive detection method for antifreeze activity at scaled down values associated with the in vitro system. In combination, these studies indicate that the adaptation mechanisms contributing to the overall antifreeze protein response in a cold hardy insect involves a complex interaction between antifreeze proteins and endogenous activators of these proteins. With the availability of these key tools, the details of a precise and seasonal regulation of these antifreeze protein/activator interactions, which ultimately generate an efficient cold hardy response, now have the potential to be worked out.

L90 ANSWER 46 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1997:124669 HCPLUS
 DN 126:235947
 TI Purification, characterization, and structural analysis of a plant low-temperature-induced protein
 AU Botthe, Joseph G.; Sonnichsen, Frank D.; de Bues, Mitchel D.;)
 Johnson-Flanagan, Anne M.
 CS Dep. Agric., Univ. Alberta, Edmonton, AB, T6G 2P5, Can.
 SO Plant Physiology (1997), 113(2), 367-376
 CODEN: PLPHAY; ISSN: 0032-0889
 PB American Society of Plant Physiologists
 DT Journal
 LA English
 AB We have purified to near homogeneity a recombinant form of the protein BN28 (rBN28), expressed in response to low temperature in *Brassica napus* plants, and we have determined its solution structure. Antibodies raised against rBN28 were used to characterize the recombinant and native proteins. Similar to many other low-temperature-induced proteins, BN28 is extremely hydrophilic, such that it remains soluble following boiling. Immunoblot anal. of subcellular fractions indicated that BN28 was not strongly associated with cellular membranes and was localized exclusively within the soluble fraction of the cell. Contrary to predicted secondary structure that suggested significant helical content, CD anal. revealed that rBN28 existed in aqueous solution largely as a random coil. However, the helical propensity of the protein could be demonstrated in the presence of trifluoroethanol. NMR anal. further showed that rBN28 was in fact completely unstructured (100% coil) in aqueous solution. Although it had earlier been speculated that BN28-like proteins from *Arabidopsis thaliana* might possess antifreeze protein activity, no such activity could be detected in ice recrystn. assays with rBN28.

L90 ANSWER 47 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1996:739617 HCPLUS
 DN 126:44122
 TI A study of the growth rates and growth habits of ice crystals in a solution of antifreeze (glyco) proteins
 AU Li, Qianzhong; Luo, Liaofu
 CS Laboratory of Theoretical Physics and Biology, Physics Department, Inner Mongolia University, Hohhot, 010021, Peop. Rep. China
 SO Chemical Physics Letters (1996), 263(5), 651-654
 CODEN: CHPLBC; ISSN: 0009-2614
 PB Elsevier
 DT Journal
 LA English
 AB The mechanism of the antifreeze glycoprotein/antifreeze protein interaction on the surface of ice is analyzed. The theory of ice crystal

growth in an AF(G)P solution is presented. A quant. calcn. of the growth rates for grain growth has been obtained. The anisotropic growth habits and growth rates of ice crystals in an AF(G)P solution are explained.

L90 ANSWER 48 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1996:492029 HCPLUS
 DN 125:191250
 TI Cryopreservation of mammalian embryos and oocytes: Recent advances
 AU Palasz, Andre T.; Mapletoft, Reuben J.
 CS WCVM, University Saskatchewan, Saskatoon, SK, S7N 5B4, Can.
 SO Biotechnology Advances (1996), 14(2), 127-149
 CODEN: BIADDD; ISSN: 0734-9750
 PB Elsevier
 DT Journal; General Review
 LA English
 AB A review with 149 refs. The cryopreservation of embryos of most domestic species has become a routine procedure in embryo transfer, and recently, advances have been made in the cold storage of mammalian oocytes. The ability to sustain viable oocytes and embryos from mammalian species at low temperature for prolonged periods of time has important implications to basic and applied biotechnol. Recent advances in the study of physicochem. behavior of different cryoprotectants, use of various macromol. additives in cryoprotective solns. and isolation and use of proteins of plant and animal origin with antifreeze activity offers many new options for cryopreservation of oocytes and embryos of animal and human origin. At the same time rapidly developing methods of oocyte/embryo manipulation such as in vitro embryo production, embryo splitting, embryo biopsies for gene and sex determination, embryo cloning and the isolation of individual blastomeres, create new challenges in cryopreservation. Very recent advances in the cryopreservation of mammalian oocytes, in vivo- and in vitro-derived embryos, and micromanipulated embryos are reviewed in this manuscript.

L90 ANSWER 49 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1996:233990 HCPLUS
 DN 124:310590
 TI The growth habits of ice crystals in fishy antifreeze polypeptide solution
 AU Li, Quianzhong
 CS Laboratory of theoretical Physics and Biology, Neimonggu Univ., Hohhot, 010021, Peop. Rep. China
 SO Neimenggu Daxue Xuebao, Ziran Kexueban (1996), 27(1), 58-60
 CODEN: NDZKEJ; ISSN: 1000-1638
 PB Neimenggu Daxue Xuebao Bianjibu
 DT Journal
 LA Chinese
 AB The structural properties of fish antifreeze polypeptide and the mechanisms of AGFP/AFP interaction on the surface of ice crystal were studied. The theory of an ice crystal growth in AFGP/AFP solution was presented. The periodic bond chain theory was expressed in a quant. form. The anisotropic growth habits of ice crystals were explained.

L90 ANSWER 50 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1996:185582 HCPLUS
 DN 124:253761
 TI Cloning and Baculovirus expression of a desiccation stress gene from the

AU beetle, *Tenebrio molitor*
 AU Graham, Laurie A.; Bendena, William G.; Walker, Virginia K.
 CS Dep. of Biology, Queen's Univ., Kingston, ON, K7L 3N6, Can.
 SO Insect Biochemistry and Molecular Biology (1996), 26(2), 127-33
 CODEN: IBMBES; ISSN: 0965-1748
 PB Elsevier
 DT Journal
 LA English
 AB The cDNA sequence encoding a novel desiccation stress **protein** (dsp28) found in the hemolymph of the common yellow mealworm beetle, *Tenebrio molitor*, has been determined, the sequence encodes a 225 amino acid **protein** containing a 20 amino acid signal **peptide**. The dsp28 shows no significant similarity to any known nucleic acid or **protein** sequence. Levels of dsp28 mRNA were found to increase approx. 5-fold following desiccation. The dsp28 cDNA has been cloned into a baculovirus expression vector and the expressed **protein** was compared to native dsp28. Both dsp28 expressed by recombinant baculovirus and native dsp28 are glycosylated and N-terminally processed. Although dsp28 is induced by cold and addition to desiccation stress, it does not contribute to the f.p. depression (**thermal hysteresis**) observed in *Tenebrio* hemolymph.

L90 ANSWER 51 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1996:78870 HCPLUS
 DN 124:140186
 TI Direct measurement of **thermal hysteresis** effect of **antifreeze protein solution** by differential scanning calorimetry
 AU Chen, Tingchao; Zhang, Jizhen; Yang, Jingwen; Ye, Wen; Fei, Yunbiao
 CS Inst. Biophys., Acad. Sinica, Beijing, 100101, Peop. Rep. China
 SO Shengwu Wuli Xuebao (1995), 11(3), 309-13
 CODEN: SWXUEN; ISSN: 1000-6737
 PB Shengwu Wuli Xuebao
 DT Journal
 LA Chinese
 AB The direct microscopic observation has been used to measure the **thermal hysteresis** effects of **antifreeze** **proteins** in the literature. The amount of **ice** **crystals** in the system is roughly estimated by the observed volume of **ice** **nuclei**, and thus it is much more artificial. Here we report a direct differential scanning calorimetric measurement of the **thermal hysteresis** effect of **antifreeze** **protein** solution from *amnopiptanthus mongolicus*. The **thermal hysteresis** temperature and amount of **ice** **crystal** **nuclei** are quant. measured from DSC **thermograms**, melting and **freezing** enthalpies. Compared to the results reported in the literature, this **antifreeze protein** shows a much higher **antifreeze** activity and thus a new and accurate procedure to measure the activity of **antifreeze** **protein** **solution** is provided.

L90 ANSWER 52 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1996:4538 HCPLUS
 DN 124:80068
 TI Second harmonic generation studies of the **ice**/water interface
 AU Bouchez, Cynthia M.; Hicks, Janice M.
 CS Department Chemistry, Georgetown University, Washington, DC, 20057, USA
 SO Proceedings of SPIE-The International Society for Optical Engineering (1995), 2547(Laser Techniques for Surface Science II), 152-63
 CODEN: PSISDG; ISSN: 0277-786X
 PB SPIE-The International Society for Optical Engineering
 DT Journal
 LA English

AB Understanding the structure of the interface between ice and liquid water is essential to the study of mol. adsorption at this boundary. Despite great interest in the ice/water interface, exptl. studies are sparse. In this work, the nonlinear optical laser technique, second harmonic generation (SHG), is used in a total internal reflection (TIR) geometry to probe the single crystalline ice/water interface. SHG signals from the clean ice/water interface are observed and attributed to symmetry breaking at the boundary. The authors report observation of a linear adsorption isotherm when water is replaced by 0.2 to 7 μ M solns. of 2,2'-dihydroxy-1,1'-binaphthyl (BN). The coverage is most likely submonolayer; therefore, the authors observe only the beginning of the adsorption profile. The authors argue that BN adsorption is entropy driven. In a sep. study, 0.02 to 1 mg/mL solns. of winter flounder antifreeze protein are contacted with the ice. The adsorption profile closely follows the f.p. depression activity curve of the protein.

L90 ANSWER 53 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1995:765907 HCPLUS

DN 123:166092

TI Antifreeze glycoproteins promote intracellular freezing of rat cardiomyocytes at high subzero temperatures

AU Mugnano, J. A.; Wang, T.; Layne, J. R., Jr.; DeVries, A. L.; Lee, R. E., Jr.

CS Dep. Zool., Miami Univ., Oxford, OH, 45056, USA

SO American Journal of Physiology (1995), 269(2, Pt. 2), R474-R479

CODEN: AJPHAP; ISSN: 0002-9513

PB American Physiological Society

DT Journal

LA English

AB Despite recent reports that antifreeze glycoproteins (AFGPs) protect mammalian cells during low-temperature preservation, T. Wang, et al. (1994) reported that AFGPs failed to protect rat hearts during freezing. Rather, the presence of AFGPs exacerbated cardiac damage after freezing. This study examined the effects of freezing (-4°C) in the presence of AFGPs at the cellular level with the use of cryomicroscopy. Large, blunt ice crystals formed in the solns. without AFGPs and excluded most cardiomyocytes from the plane of ice formation. After thawing, cells appeared similar in morphol. to unfrozen cells. Ice in 0.5 mg/ml AFGP solution was more dendritic and prismatic than ice formed in the absence of AFGPs. On thawing, many cells exhibited spontaneous contraction, resulting in cell death. Spicular ice formed rapidly in the 10 mg/ml AFGP solution. These needlelike ice crystals appeared to penetrate the cardiomyocytes, resulting in intracellular freezing followed by cell lysis. These AFGP-induced changes in ice crystal structure may account for the injury observed in whole heart and cardiomyocyte expts.

L90 ANSWER 54 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1995:533953 HCPLUS

DN 123:6651

TI Evaluation of propanediol, ethylene glycol, sucrose and antifreeze proteins on the survival of slow-cooled mouse pronuclear and 4-cell embryos

AU Shaw, J. M.; Ward, C.; Trounson, A. O.

CS Institute Reproduction and Development, Monash University, Clayton, 3168, Australia

SO Human Reproduction (1995), 10(2), 396-402

CODEN: HUREEE; ISSN: 0268-1161

DT Journal
 LA English
 AB Mouse pronuclear and 4-cell embryos were **cryopreserved** by slow cooling to -33° in 1.5 M 1,2-propanediol or 1.5 M ethylene glycol, with or without 0.1 M sucrose. Straws were thawed by immersion into a 37° water bath, immediately after their removal from liquid nitrogen (protocol 1), or after being held in air for 15 (protocol 2) or 30 s (protocol 3). Others were held in air until the ice melted (protocol 4). Embryos which formed blastocysts that hatched and attached to the Petri dish in vitro (plated) were considered viable. The thawing protocol did not significantly influence the viability of embryos **frozen** in propanediol with 0.1 M sucrose (52-72% of pronuclear and 69-97% of 4-cell embryos plated). In the other solns. tested, propanediol without sucrose and ethylene glycol with/without sucrose, only protocol 2 resulted in uniformly high development of both pronuclear (45-65% plating) and 4-cell embryos (70-97% plating). Thawing protocol 4 significantly reduced development, in particular for embryos **frozen** in ethylene glycol (0% 1-cell; 0-25% 4-cell plating). The difference between thawing protocols 2 and 4 was reduced by continuing slow cooling of ethylene glycol solns. to lower temps. (-41°). Adding **antifreeze proteins** type I or III did not improve survival or development. Thus, although mouse pronuclear and 4-cell embryos can be **frozen-thawed** in either ethylene glycol or propanediol without significant loss of viability, an appropriate thawing protocol is essential for embryos **frozen** in ethylene glycol or propanediol-sucrose.

L90 ANSWER 55 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1995:373187 HCPLUS
 DN 122:129063
 TI Biochemical and molecular biological studies of **antifreeze proteins** from the insect *Tenebrio molitor*
 AU Tang, Wei
 CS State Univ. New York, Binghampton, NY, USA
 SO (1993) 154 pp. Avail.: Univ. Microfilms Int., Order No.
 DA9417873
 From: Diss. Abstr. Int. B, 1994, 55(2), 307-8
 DT Dissertation
 LA English
 AB Unavailable

L90 ANSWER 56 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1995:202635 HCPLUS
 DN 122:3729
 TI Measurement of grain growth in the **recrystallization** of rapidly **frozen** **solutions** of **antifreeze** **glycoproteins**
 AU Yeh, Y.; Feeney, R. E.; Mckown, R. L.; Warren, G. J.
 CS Univ. California, Davis, CA, USA
 SO Biopolymers (1994), 34(11), 1495-504
 CODEN: BIPMAA; ISSN: 0006-3525
 PB Wiley
 DT Journal
 LA English
 AB A quant. estimate of the activation energy for grain growth has been obtained by analyzing **ice recrystn.** expts. from water and from solns. with small amts. (<1.0 μ g/mL) of **antifreeze** **glycoprotein** (AFGP). Rates of grain growth are measured as changes of grain diameter in time, with the supercooled holding temperature and **glycoprotein** concentration as parameters. Arrhenius plots of these rates vs. (1/T) yielded slopes proportional to the activation energies for the particular species. The values of activation energy are almost

independent of solution concentration or the species of AFGP. Averaged activation energy value for the AFGP-4 species is $Q_g = (6.61) + 105$ J/mol. The "less active" AFGP-8 yielded an average $Q_g = (5.71) + 105$ J/mol, quite similar to the AFGP-4 species. The activation energy for recrystn. in a pure ice-water system was estimated from two temperature points, $t = -5.4$ and -7.5° . The best value is $2.39+105$ J/mol, nearly twice that obtained by M. N. Martino and N. E. Zaritsky [(1989) *Cryobiol.*, Volume 26, p. 138] in a recrystn. experiment using salt soln., but much smaller than the values derived from the AFGP solns. Results further show that activation entropy is at least a factor of 2 larger for the AFGP species than that of pure ice-water system under the same growth conditions. These results suggest significant roles, both energetically and entropically, for AFGP mols. in their ability to inhibit grain growth of ice.

L90 ANSWER 57 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1994:553829 HCPLUS
 DN 121:153829
 TI Characterization of primary cell cultures derived from fat body of the beetle, *Tenebrio molitor*, and the immunolocalization of a thermal hysteresis protein in vitro
 AU Easton, Christopher M.; Horwath, Kathleen L.
 CS Department of Biological Sciences, Binghamton University, Binghamton, NY, 13902-6000, USA
 SO Journal of Insect Physiology (1994), 40(6), 537-47
 CODEN: JIPHAF; ISSN: 0022-1910
 DT Journal
 LA English
 AB A cell culture system was developed for *Tenebrio molitor* fat body to investigate the regulation of thermal hysteresis protein (THP) production. To establish the reliability of this system the authors compared the histol. and THP distribution of cultured fat body cells to the features of intact tissue. Cell cultures established from fat body contained three major cell types: globular, stellate and rounded cells. Globular cells resembled mature trophocytes of in vivo fat body. They contained large lipid vesicles, protein granules, and extensive glycogen stores. Stellate and rounded cells lacked protein granules, and contained varying amts. of lipids and glycogen. THPs were localized in the cytoplasm of cultured cells, associated with protein-containing granules in globular cells, or within discrete vesicles in the other cell types. In intact fat body, THPs were primarily localized to the accumulated protein granules. These results are the first to suggest that there is intracellular storage of THPs in the fat body. Such storage provides the potential for later mobilization during periods of low temperature and/or desiccation. Furthermore, the authors' fat body primary cultures morphol. and functionally resemble their in vivo counterparts and will be useful in addressing questions about the regulation of THP synthesis and secretion by insect fat body.

L90 ANSWER 58 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1994:530859 HCPLUS
 DN 121:130859
 TI Antifreeze glycoproteins from Antarctic notothenioid fishes fail to protect the rat cardiac explant during hypothermic and freezing preservation
 AU Wang, Tingchung; Zhu, Qingyan; Yang, Xiaoping; Layne, Jack R. Jr.; Devries, Arthur L.
 CS Dep. Surg., Univ. Rochester, Rochester, NY, 14642, USA
 SO Cryobiology (1994), 31(2), 185-92

CODEN: CRYBAS; ISSN: 0011-2240

DT Journal

LA English

AB The Antarctic notothenioid fishes avoid freezing through the action of circulating antifreeze glycoproteins (AFGPs). This study investigated whether AFGPs could serve as cryoprotectants for the isolated rat heart under three different storage conditions. Hearts were flushed with 15 mg AFGP/mL cardioplegic solution (CP) and stored for 9 h at 0°. This AFGP concentration has been reported to protect pig oocytes during hypothermic storage. Hearts were flushed with 10 mg AFGP/mL CP-14 and stored frozen at -1.4° for 3 h. At this concentration the AFGPs reduce the solution f.p. and also change the crystal morphol. from dendritic to spicular. Hearts were flushed with 10 µg AFGP/mL CP-15 and stored frozen at -1.4° for 5 h. At this low concentration the AFGPs have a strong inhibitory effect on ice recrystn., but have little effect on the f.p. and less apparent effect on the crystal habit. After hypothermic or freezing storage, the functional viability was assessed by determining cardiac output (CO) during working reperfusion. No difference in CO was found between AFGP-treated and untreated hearts after 9 h of 0° storage. CO in hearts frozen in CP-14 without AFGPs recovered to 50% of the freshly perfused control hearts. Hearts frozen in the presence of high concns. of AFGPs (10 mg/mL CP-14) failed to beat upon thawing and reperfusion, although their tissue ice content was less than that found in hearts without AFGP treatment. Hearts frozen with low concns. of AFGPs (10 µg/mL CP-15) showed reduced recovery upon thawing and reperfusion compared to CP-15 hearts, which recovered to 67% of freshly perfused controls. Thus, notothenioid fish AFGPs not only fail to enhance storage of the isolated rat heart preparation at hypothermic temps., but cause increased damage under freezing conditions regardless of AFGP concentration

L90 ANSWER 59 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1994:266141 HCPLUS

DN 120:266141

TI Extraction and isolation of antifreeze proteins from winter rye (*Secale cereale* L.) leaves

AU Hon, Wai-Ching; Griffith, Marilyn; Chong, Pele; Yang, Daniel S. C.

CS Dep. Biochem., McMaster Univ., Hamilton, ON, L8N 3Z5, Can.

SO Plant Physiology (1994), 104(3), 971-80

CODEN: PLPHAY; ISSN: 0032-0889

DT Journal

LA English

AB Apoplastic exts. of cold-acclimated winter rye (*Secale cereale* cv Musketeer) leaves were previously shown to exhibit antifreeze activity. The objectives of the present study were to identify and characterize individual antifreeze proteins present in the apoplastic exts. The highest protein concns. and antifreeze activity were obtained when the leaf apoplast was extracted with ascorbic acid and either CaCl₂ or MgSO₄. Seven major polypeptides were purified from these exts. by one-dimensional SDS-PAGE under nonreducing conditions. The five larger polypeptides, of 19, 26, 32, 34, and 36 kD, exhibited significant levels of antifreeze activity, whereas the 11- and 13-kD polypeptides showed only weak activity. Five of these polypeptides migrated with higher apparent mol. masses on SDS gels after treatment with 0.1 M dithiothreitol, which indicated the presence of intramol. disulfide bonds. The apparent reduction of the disulfide bonds did

not eliminate antifreeze activity in four of the **polypeptides** that contained intramol. disulfide bonds and exhibited significant levels of antifreeze activity. The amino acid compns. of these **polypeptides** were similar in that they were all relatively enriched in the residues Asp/Asn, Glu/Gln, Ser, Thr, Gly, and Ala; they all lacked His, except for the 26-kD **polypeptide**, and they contained up to 5% Cys residues. These **polypeptides** were examined with antisera to other cystine-containing antifreeze proteins from fish and insects, and no common epitopes were detected. It is concluded that cold-acclimated winter rye leaves produce multiple **polypeptides** with antifreeze activity that appear to be distinct from antifreezes produced by fish and insects.

L90 ANSWER 60 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1994:212024 HCAPLUS

DN 120:212024

TI Protein purification from a complex solution with silica gel as sorbent

IN Lusk, Lance T.; Goldstein, Henry

PA Miller Brewing Co., USA

SO U.S., 7 pp.

CODEN: USXXAM

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 5278284	A	19940111	US 1992-882793	19920514 <--
	EP 646594	A1	19950405	EP 1993-115953	19931002 <--
	EP 646594	B1	19970604		
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LI, LU, MC, NL, PT, SE				
	AT 154033	E	19970615	AT 1993-115953	19931002 <--
	ES 2105033	T3	19971016	ES 1993-115953	19931002 <--
	JP 07145192	A2	19950606	JP 1993-251960	19931007 <--
PRAI	US 1992-882793		19920514 <--		
	EP 1993-115953		19931002 <--		

AB A method of removing a protein from a complex solution and recovering the protein in purified form consists of adding a silica gel sorbent having a pore size approx. the mol. size of the protein to a solution containing the protein, allowing the protein to be sorbed onto the sorbent, separating the sorbent from the solution, and then recovering the protein from the sorbent. To demonstrate the usefulness of the method in removing a valuable protein from milk, anti-freeze protein (AFP) was mixed with cow's milk to yield a mixture which might be similar to the milk from a transgenic cow producing AFP. The AFP was effectively separated from the casein, whey milk proteins and cream with the silica cogel DP4660. The micellar forms of casein and whey were probably excluded from the cogel pores. The AFP was desorbed from the DP4660 with 50% ethanol.

L90 ANSWER 61 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1994:102680 HCAPLUS

DN 120:102680

TI Microscopic pattern of ice crystal growth in the presence of thermal hysteresis proteins

AU Coger, Robin; Rubinsky, Boris; Fletcher, Garth

CS Dep. Mech. Eng., Univ. California, Berkeley, CA, USA

SO HTD (American Society of Mechanical Engineers) (1992), 205 (Heat Transfer in Phase Change), 37-46

CODEN: ASMHD8; ISSN: 0272-5673

DT Journal

LA English

AB This study examines the effect of thermal hysteresis proteins (THPs) from the winter flounder (*Pleuronectes americanus*) on the ice-water interface morphol. during freezing of aqueous solns. Expts. were performed using a directional solidification stage, and the development of the two phase interface was observed through a light microscope and recorded by a video system. Unusual ice crystal morphologies were observed, including faceted ice crystal growth along the [1100] crystal plane; spicular, or needle-like ice crystal growth in the [1010] direction; and ice crystal growth in the direction of the c-axis, [0001], with incorporated liquid inclusions bounded by hexagonal prism faces. The observed crystallog. structures can be explained as an effect of the interaction between the THPs and the primary prism faces of ice crystals. This results in an increase in the Gibbs free energy of these planes, followed by ice growth into the thermodynamically supercooled liquid adjacent to these faces.

L90 ANSWER 62 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1994:99763 HCAPLUS

DN 120:99763

TI The kinetic theory of thermal hysteresis of a macromolecule solution

AU Li, Qianzhong; Luo, Liaofu

CS Physics Department, Inner Mongolia University, Huhehote, 010021, Peop. Rep. China

SO Chemical Physics Letters (1993), 216(3-6), 453-7

CODEN: CHPLBC; ISSN: 0009-2614

DT Journal

LA English

AB By use of the Flory-Huggin lattice model, the kinetic theory of the thermal hysteresis (the difference between the growing point and m.p. of ice crystals) of a macromol. solution is presented. As an example, the thermal hysteresis of an antifreeze protein solution is calculated

L90 ANSWER 63 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1993:6222774 HCAPLUS

DN 119:2222774

TI Hypothermic preservation of human oocytes with antifreeze proteins from sub-polar fish

AU Itsikovitz-Eldor, J.; Levron, J.; Arav, A.; Bar-Ami, S.; Stein, D. W.; Fletcher, G. L.; Rubinsky, B.

CS Dep. Obstet. Gynecol., Rambam Med. Cent., Haifa, 31096, Israel

SO Cryo-Letters (1993), 14(4), 235-42

CODEN: CRLED9; ISSN: 0143-2044

DT Journal

LA English

AB Mature human oocytes were preserved at 4° for 20 h in phosphate buffer solution (PBS) and in PBS solution with various concns. of antifreeze proteins (AFPs) isolated from the winter flounder or the ocean pout. Fertilization and early embryo cleavage rates were increased by the addition of AFPs 1 mg/mL and reduced when the concentration of AFPs was increased to 10 mg/mL. These preliminary results are consistent with earlier animal studies and with the known ability of AFPs to stabilize membranes at hypothermic temps.

L90 ANSWER 64 OF 99 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1993:250983 HCAPLUS

DN 118:250983

TI Devitrification in butane-2,3-diol solutions containing anti-freeze peptide
 AU Sutton, Robin L.; Pegg, David E.
 CS Dep. Surg., MRC Med. Cryobiol. Group, Cambridge, CB2 2AH, UK
 SO Cryo-Letters (1993), 14(1), 13-20
 CODEN: CRLED9; ISSN: 0143-2044
 DT Journal
 LA English
 AB Cryopreservation of viable tissues and organs by vitrification requires that devitrification (freezing) be prevented during warming. It is reported that a synthetic antifreeze, modeled on the natural peptide found in the Winter Flounder *Pseudopleuronectes americanus*, substantially raises the devitrification temperature of solns. of the cryoprotectant butane-2,3-diol. The addition of 1% weight/weight peptide reduces the min. warming rate to avoid devitrification of a 30% solution by a factor of 7000.

L90 ANSWER 65 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1993:207877 HCPLUS
 DN 118:207877
 TI Molecular dynamics simulation of winter flounder antifreeze protein variants in solution: correlation between side chain spacing and ice lattice
 AU Jorgensen, H.; Mori, M.; Matsui, H.; Kanaoka, M.; Yanagi, H.; Yabusaki, Y.; Kikuzono, Y.
 CS Biotechnol. Lab., Sumitomo Chem. Co., Ltd., Takarazuka, 665, Japan
 SO Protein Engineering (1993), 6(1), 19-27
 CODEN: PRENE9; ISSN: 0269-2139
 DT Journal
 LA English
 AB The solution structure of the 38 amino acid C-terminal region of the precursor for the HPLC-6 antifreeze protein from winter flounder has been investigated with mol. dynamics using the AMBER software. The simulation for the peptide in aqueous solution was carried out at a constant temperature of 0° and at atmospheric pressure.

The simulation covered 120 ps and the results were analyzed based on data sampled upon reaching a stable equilibrium phase. Information has been obtained on the quality of constant temperature and pressure simulations, the solution structure and dynamics, the hydrogen bonding network, the helix-stabilizing role of terminal charges and the interaction with the surrounding water mols. The Lys18-Glu22 interactions and the terminal charged residues are found to stabilize a helical structure with the side chains of Thr2, Thr13, Thr24 and Thr35 equally spaced on one side of the helix. The spacing between oxygen atoms in the hydroxyl group of the threonine side chains exhibits fluctuations of the order of 2-3 Å during the 120 ps of simulation, but values simultaneously close to the repeat distance of 16.6 Å between oxygen atoms along the [01.hivin.12] direction in ice are observed. Furthermore, two engineered variants were studied using the same simulation protocol.

L90 ANSWER 66 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1993:163527 HCPLUS
 DN 118:163527
 TI Low temperature crystallization of aqueous solutions in the presence of serum antifreeze glycoproteins of the cod *Gadus morhua*
 AU Karanova, M. V.; Andreev, A. A.; Petropavlov, N. N.
 CS Inst. Biol. Phys., Pushchino, Russia
 SO Problemy Kriobiologii (1992), (1), 23-7
 CODEN: PKRIEA; ISSN: 1026-1230
 DT Journal
 LA Russian

AB The structure of ice formed upon freezing of aqueous solns. in the presence of antifreeze glycoproteins of different purification degrees isolated from *G. morhua* serum consists of line crystals with indistinct interfaces. Sometimes, the crystals had a distinct axial direction.

L90 ANSWER 67 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1992:171053 HCPLUS

DN 116:171053

TI The cryoprotective effect of antifreeze glycopeptides from Antarctic fishes

AU Rubinsky, B.; Arav, A.; DeVries, A. L.

CS Dep. Mech. Eng., Univ. California, Berkeley, CA, 94720, USA

SO Cryobiology (1992), 29(1), 69-79

CODEN: CRYBAS; ISSN: 0011-2240

DT Journal

LA English

AB The addition of fish antifreeze glycopeptides (AFGPs) to vitrifying solns. increases post-thaw viability in cultured immature pig oocytes and 2-cell stage embryos of mice and pigs after rapid cooling to cryogenic temps. The criterion for viability is maturation to metaphase for the oocytes and the ability to develop into the 4-cell stage for the pig embryo and the blastocyst stage for the mouse embryo. Without AFGPs, or with addition of antifreeze peptides (AFPs), the particular vitrifying solution and cooling/warming/culturing regime used in this study produced zero viability. In the presence of the AFGPs (40 mg/mL), survival of pig oocytes and embryos was increased to .apprx.25%, and that of mouse embryos to 82%. Dose-response studies for the mouse embryos showed that the protective effect of AFGPs shows saturation kinetics and levels off at 20 mg/mL. The AFGPs appeared to preserve cell membrane structural integrity; however, an intact cell membrane did not always lead to viability. The absence of protective effect by AFPs suggests that protection by the AFGPs is unrelated to their common antifreeze property, i.e., inhibition of ice crystal growth, but probably results from interaction with and stabilization of the cell membranes unique to the AFGPs.

L90 ANSWER 68 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1992:170715 HCPLUS

DN 116:170715

TI A role for juvenile hormone in the induction of antifreeze protein production by the fat body in the beetle *Tenebrio molitor*

AU Xu, Lei; Duman, John G.; Wu, Ding Wen; Goodman, Walter G.

CS Dep. Biol. Sci., Univ. Notre Dame, Notre Dame, IN, 46556, USA

SO Comparative Biochemistry and Physiology, Part B: Biochemistry & Molecular Biology (1992), 101B(1-2), 105-9

CODEN: CBPBB8; ISSN: 0305-0491

DT Journal

LA English

AB *Tenebrio* larvae treated topically with JH-I and maintained under non-inducing conditions (16 light/8 dark photoperiod 23° and 90% relative humidity) elevated hemolymph antifreeze protein activity and concentration. Juvenile hormone (JH) titers (measured by RIA) were elevated in larvae acclimated to antifreeze protein inducing conditions (short photoperiod or cold temperature). Fat bodies incubated in Grace's medium increased antifreeze protein when JH was added to the medium, but only when the fat bodies were taken from larvae which had been primed by a previous JH treatment.

L90 ANSWER 69 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1992:2444 HCPLUS
 DN 116:2444
 TI Calorimetric analysis of **antifreeze glycoproteins** of the polar **fish**, *Dissostichus mawsoni*
 AU Hansen, Thomas N.; DeVries, Arthur L.; Baust, John G.
 CS Cent. Cryobiol. Res., SUNY, Binghamton, NY, 13901, USA
 SO Biochimica et Biophysica Acta (1991), 1079(2), 169-73
 CODEN: BBACAO; ISSN: 0006-3002
 DT Journal
 LA English
 AB Solns. of **antifreeze glycoproteins** 1 through 5 and 8 were analyzed for activity by differential scanning calorimetry. With a scan rate of 1° min-1, **antifreeze glycoproteins** 1-5 (20 mg/mL) revealed **antifreeze** activity with a delay in the **freeze** exotherm during cooling in the presence of **ice**. **Antifreeze glycoprotein** 8 (60 mg/mL), however, did not reveal **antifreeze** activity. When a 0.1° min-1 scan rate was used, **glycoproteins** 1-5 again yielded a delay in the **freeze** onset, but the exotherm consisted of multiple events. At the slower scan rate **glycoprotein** 8 revealed an initial **freeze** followed by multiple exothermic events resembling those of **glycoproteins** 1-5. **Thermograms** exhibiting **antifreeze** activity had an initial shoulder in the exotherm direction upon cooling followed by a delay before the exotherm. The shoulders were correlated with c-axis **ice** growth observed in visual methods. The **glycoprotein antifreezes** had a linear increase in activity with decreased **ice** content.

L90 ANSWER 70 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1991:667158 HCPLUS
 DN 115:267158
 TI Investigations of the differential affinity of **antifreeze glycoprotein** for single **crystals** of **ice**
 AU Feeney, R. E.; Fink, W. H.; Hallett, J.; Harrison, K.; Osuga, D. T.; Vesenka, J. P.; Yeh, Y.
 CS Dep. Food Sci. Technol., Univ. California, Davis, CA, 95616, USA
 SO Journal of Crystal Growth (1991), 113(3-4), 417-29
 CODEN: JCRGAE; ISSN: 0022-0248
 DT Journal
 LA English
 AB Two distinctively different expts. showing the differential affinity of **antifreeze glycoproteins** (AFGP) for the facets of **ice crystals** are presented. In free growth studies of single seed **crystals** of **ice** into **solns**. of AFGP, clear distinction between **crystals** growing in the **AFGP solution** and similar **crystals** growing in pure water is found. Immediately upon going below the temperature of freezing depression, **crystals** grow along the c-axis as long spicules, not dendrites within the basal plane as is the case of growth in pure water. The rates of growth of the spicules are higher than growth velocity of dendrites in pure water. As the supercooling is increased, both morphol. and rate become more like that of growth in pure water. Dynamic light scattering studies of the **ice-soln** interface were also conducted. In these expts., the local concentration of AFGP in the neighborhood of the interface was monitored by the effect of these mols. on microbubbles present near the growing interface; AFGP mols. showed preference towards the prismatic facets. All of these exptl. observations support the idea of a dynamic adsorption/desorption equilibrium that is facet dependent.

L90 ANSWER 71 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1991:578705 HCPLUS
 DN 115:178705
 TI The effect of antifreeze protein on the
 devitrification of a cryoprotective system
 AU Chang, Zhaohua; Hansen, Thomas N.; Baust, John G.
 CS Cent. Cryobiol. Res., State Univ. New York, Binghamton, NY, 13902-6000,
 USA
 SO Cryo-Letters (1991), 12(4), 215-26
 CODEN: CRLED9; ISSN: 0143-2044
 DT Journal
 LA English
 AB The effects of antifreeze protein (AFP) from
 the common mealworm, *Tenebrio molitor*, on the
 devitrification of a glassy system (55% aqueous glycerol) were studied by
 differential scanning calorimetry. The effects of various concns. of
 AFP extract (1 to 200 mg/mL) were analyzed at various warming rates
 (0.5 to 20° min. ⁻¹). The results revealed that while the
 glass-liquid transition temperature was only slightly affected, the
 devitrification event generally shifted to lower temps. with the addition of
 AFP. For a vitrified sample warmed at a rate higher than
 2.5° min. ⁻¹, the presence of AFP (100 mg/mL) depressed
 the devitrification temperature but not the ice content. The extent
 of devitrification was generally reduced at very slow warming rates and/or
 higher AFP concentration (>150 mg/mL). The results suggest that the
 addition of AFP to cryoprotective solns. may
 have adverse effects on cryopreservation, although the
 application of high concentration of AFP in combination with low
 warming rates seems to help stabilize the glassy state and therefore may
 improve the survival rate of cryopreserved samples.

L90 ANSWER 72 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1991:140235 HCPLUS
 DN 114:140235
 TI Enhancement of insect antifreeze protein activity by
 antibodies
 AU Wu, Ding Wen; Duman, John G.; Xu, Lei
 CS Dep. Biol. Sci., Univ. Notre Dame, Notre Dame, IN, 46556, USA
 SO Biochimica et Biophysica Acta (1991), 1076(3), 416-20
 CODEN: BBACAO; ISSN: 0006-3002
 DT Journal
 LA English
 AB The activity of 2 insect antifreeze proteins is
 greatly increased by the addition of specific rabbit polyclonal antibodies to
 the antifreezes. A model is presented which suggests that the
 enhancement occurs because the antifreeze-antibody complex,
 being much larger than the antifreeze protein alone (a
 minimal 7-8-fold increase in size), blocks a larger area of the ice
 crystal surface and extends further above the surface, thus requiring the
 temperature to be further lowered before crystal growth proceeds. This idea is
 further supported by the finding that addition of goat anti-rabbit IgG to the
 antifreeze protein + anti-antifreeze
 protein antibody complexes further enhanced activity.

L90 ANSWER 73 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1989:590897 HCPLUS
 DN 111:190897
 TI Differential scanning calorimetric analysis of *Tenebrio*
 molitor antifreeze protein activity
 AU Hansen, Thomas N.; Baust, John G.
 CS Cent. Cryobiol. Res., State Univ. New York, Binghamton, NY, 13901, USA
 SO Cryobiology (1989), 26(4), 383-8
 CODEN: CRYBAS; ISSN: 0011-2240
 DT Journal

LA English
 AB Recently a new method for anal. of **antifreeze proteins** by differential scanning calorimetry has been developed (Hansen, T. N.; Baust, J. G., 1988). However, the parameters used were not examined for possible maximal activity. To test the parameters, pooled hemolymph samples of the common mealworm larva, **T. molitor** (25°, 16 h:8 h light:dark), were collected and analyzed for activity. The samples were held at -40° and at various annealing temps. for different lengths of time (0 to 360 min). No difference in activity was observed in the freeze intervals, while significant differences were observed in annealing times of less than 3 min. Hemolymph samples were also tested for **antifreeze** activity at various scan rates (0.1-10°/min). Significant differences in activity were observed for each rate. Both the short annealing times and the cooling rates were due to methodol. and not sample. The best parameters consisted of a 5-min freeze at -40°, a 5-min annealing interval, and a 1°/min cooling rate. To test the optimized parameters, pooled samples of **T. molitor** hemolymph were monitored for changes in activity over time (up to 60 days) at various storage temps. (-17, -80, -196°). No changes in activity were observed. These results suggest that care must be given to the reporting of the specific conditions used in the anal. of **antifreeze** activity.

L90 ANSWER 74 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1989:36437 HCPLUS
 DN 110:36437
 TI Differential scanning calorimetric analysis of **antifreeze protein** activity in the common mealworm, **Tenebrio molitor**
 AU Hansen, Thomas N.; Baust, John G.
 CS Cent. Cryobiol. Res., State Univ. New York, Binghamton, NY, 13901, USA
 SO Biochimica et Biophysica Acta (1988), 957(2), 217-21
 CODEN: BBACAO; ISSN: 0006-3002
 DT Journal
 LA English
 AB **Antifreeze proteins (AFP)** are able to inhibit the growth of ice-crystals at temps. below the equilibrium f.p. (T_f) of hemolymph. The anal. of **AFP** activity has commonly involved the use of direct microscopic observation of a sample following inoculation with ice. The resulting activity, defined as the amount of **thermal hysteresis** observed between T_f and the subsequent rapid growth of ice, has been reported to range up to 7°. However, most studies report high level of variation, possibly due to ice-crystal size variability and the presence of nonvisible ice nuclei. A new method is described of anal. of **AFP** activity using differential scanning calorimetry. DSC anal. reveals much high activity, up to 10°, with less variation observed within a sample, and is not subject to the difficulty of accurate assessment of ice-crystal volume

L90 ANSWER 75 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1988:85457 HCPLUS
 DN 108:85457
 TI Effects of **antifreeze glycoproteins** on linear crystallization velocities of ice
 AU Kerr, W. L.; Osuga, D. T.; Feeney, R. E.; Yeh, Y.
 CS Dep. Food Sci. Technol., Univ. California, Davis, CA, 95616, USA
 SO Journal of Crystal Growth (1987), 85(3), 449-52
 CODEN: JCRGAE; ISSN: 0022-0248
 DT Journal
 LA English
 AB The crystal growths of water and solns. of **antifreeze glycoproteins (AFGP)** are compared. By using linear growth in plastic tubes, both the linear crystallization

velocities (LCV) and ice crystal growth patterns were observed as a function of temperature and concentration of AFGP. Upon lowering the temperature below the freezing temperature, there was an abrupt increase in LCV of the AFGP solution above that encountered in the pure water-ice system. This enhanced LCV formed a plateau over a wide range of supercooling, eventually changing to LCV less than that of the pure water-ice system. The growth patterns of ice in the AFGP solns. were very different (more needle-like) from that in water.

L90 ANSWER 76 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1987:511404 HCPLUS
 DN 107:111404
 TI Ice growth in supercooled solutions of antifreeze glycoprotein
 AU Harrison, K.; Hallett, J.; Burcham, T. S.; Feeney, R. E.; Kerr, W. L.; Yeh, Y.
 CS Desert Res. Inst., Reno, NV, 89506, USA
 SO Nature (London, United Kingdom) (1987), 328(6127), 241-3
 CODEN: NATUAS; ISSN: 0028-0836
 DT Journal
 LA English
 AB An antifreeze glycoprotein mixture (AFGP), isolated from the blood serum of *Pagothenia borchgrevinki*, prevented the growth of ice crystals until -0.5° , whereupon a dramatic increase in crystal growth rate (.apprx.5-fold of that in pure H₂O) was observed. Further supercooling only marginally increased this rate; so that at -2° , the rate of growth of ice in AFGP was surpassed again by that in H₂O. Substantial differences in the morphol. of crystal growth habit were observed, suggesting that AFGP mols. inhibit ice formation by blocking rough growth perpendicular to the c-axis in addition to inhibiting surface nucleation.

L90 ANSWER 77 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1987:447000 HCPLUS
 DN 107:47000
 TI Recent experimental work on solute redistribution at the ice/water interface. Implications for electrical properties and interface processes
 AU Gross, G. W.; Gutjahr, A.; Caylor, K.
 CS New Mexico Inst. Min. Technol., Socorro, NM, 87801, USA
 SO Journal de Physique, Colloque (1987), (C1), C1-527/C1-533
 CODEN: JPQCAK; ISSN: 0449-1947
 DT Journal
 LA English
 AB Redistribution of NaF, HCl, NaCl, NH₄F, and AFGP (antifreeze glycoprotein) at the ice/water interface was studied under near-equilibrium constrained growth conditions. The distribution coefficient of NaF declined from $2 + 10^{-1}$ (at 10⁻⁶ N) and the distribution coefficient of the 2 chlorides was $3 + 10^{-3}$ and invariant with initial liquid concns. in the range $5 + 10^{-6}$ N to $5 + 10^{-4}$ N. At 10⁻⁶ N concentration of the mother solution, the distribution coefficient of NH₄F is strongly pH dependent. AFGP is the most highly soluble of known impurities in ice, with a distribution coefficient close to unity. In unstirred solns., traces of AFGP in the mother solution caused an increase in the distribution coefficient of HCl due to instabilities in the flux fields of heat and solute.

L90 ANSWER 78 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1987:80581 HCPLUS
 DN 106:80581

TI **Antifreeze activity of Antarctic fish glycoprotein and a synthetic polymer**
 AU Franks, F.; Darlington, J.; Schenz, T.; Mathias, S. F.; Slade, L.; Levine, H.
 CS Dep. Bot., Univ. Cambridge, Cambridge, CB2 3EA, UK
 SO Nature (London, United Kingdom) (1987), 325(6100), 146-7.
 CODEN: NATUAS; ISSN: 0028-0836
 DT Journal
 LA English
 AB **Antifreeze glycoproteins (AFGPs) and proteins isolated from the sera of some polar fish species and overwintering insects are able to depress the freezing temperature of the aqueous body fluids (and of water) by a noncolligative mechanism.**

All previous measurements of the **antifreeze** effect have been performed on bulk samples under conditions where **ice** nucleation would be catalyzed by particulate impurities, giving limited and indeterminate degrees of undercooling. Here, the 1st measurements are reported of homogeneous (spontaneous) **ice** nucleation rates in deeply undercooled (<233 K) **solns.** of **AFGP** and polyvinylpyrrolidone (PVP), a well-characterized polymer which finds use as a **cryoprotectant**. The **antifreeze** activity is thought to derive from the sorption of **AFGP** mols. on the active growth sites of **ice** **crystals**, preventing normal growth and inducing unusual **crystal** habits. Here, expts. were performed on the **inhibition of ice crystal growth** in **solns.** containing **AFGP** and PVP under standardized conditions, and it was found that the homogeneous nucleation and **crystallization** rates were sensitive to low concns. of both substances, but **AFGP** was remarkably effective at **inhibiting ice crystal growth**.

L90 ANSWER 79 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1987:2412 HCPLUS
 DN 106:2412
 TI **Antifreeze glycopeptides and peptides: interactions with ice and water**
 AU DeVries, Arthur L.
 CS Dep. Physiol. Biophys., Univ. Illinois, IL, 61801, USA
 SO Methods in Enzymology (1986), 127(Biomembranes, Pt. O), 293-303
 CODEN: MENZAU; ISSN: 0076-6879
 DT Journal; General Review
 LA English
 AB A review and discussion with 18 refs., on the purification, detection, and properties of **antifreeze glycopeptides**, **peptides**, and **proteins** of arctic and northern temperate zone fishes. The determination of the m.p. and f.p. of **antifreeze peptide solns.** are also reviewed. The interactions of the **peptides** with **ice** and water are briefly discussed.

L90 ANSWER 80 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1986:550226 HCPLUS
 DN 105:150226
 TI **Thermoperiodic involvement in antifreeze protein production in the cold hardy beetle Dendroides canadensis: implications for photoperiodic time measurement**
 AU Horwath, Kathleen L.; Duman, John G.
 CS Dep. Biol., Univ. Notre Dame, Notre Dame, IN, 46556, USA
 SO Journal of Insect Physiology (1986), 32(9), 799-806
 CODEN: JIPHAF; ISSN: 0022-1910
 DT Journal
 LA English

AB The role for **thermoperiods** (i.e., the duration of **thermophase** (T) and **cryophase** (C) during a 24-h period) in the regulation of **antifreeze protein** production was studied in *D. canadensis*. Larvae were exposed to **thermocycles** consisting of long (16 h) and short (8 h) **thermophases** in the form T/C, 25°/17°, while maintained in a background of either constant darkness, or constant light. Short-day **thermoperiods** stimulated, whereas long-day **thermoperiods** prevented, **antifreeze protein** production under both aperiodic lighting conditions. If the C temperature was allowed to reach 13° (T/C, 25°/13°), significant differences between long- and short-day **thermoperiodic** responses persisted in both constant light and constant darkness, whereas the overall levels of **antifreeze protein** production increased under constant light conditions independent of the **thermoperiod**. Studies incorporating conflicting photothermal regimes in the form short photoperiod with a long **thermoperiod**, and vice versa, triggered intermediate **antifreeze protein** activity. Thus, *D. canadensis* are capable of distinguishing long- from short-day **thermoperiods**, over the cycling temperature from 25° to 13°, and will initiate **antifreeze protein** production under the appropriate conditions. Furthermore, the expression of this **thermoperiodic** response under both constant darkness and constant light holds important implications for photoperiodic time measurement in this species by suggesting that the circadian clock involved with daylength measurement is of an internal coincidence type. The observed interaction of the light-cycle and **thermocycle** in the regulation of **antifreeze protein** production is discussed from the perspective of entrainment of the *D. canadensis* circadian system.

L90 ANSWER 81 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1986:221063 HCPLUS

DN 104:221063

TI A kinetic description of **antifreeze glycoprotein** activity

AU Burcham, Timothy S.; Osuga, David T.; Yeh, Yin; Feeney, Robert E.

CS Dep. Food Sci. Technol., Univ. California, Davis, CA, 95616, USA

SO Journal of Biological Chemistry (1986), 261(14), 6390-7

CODEN: JBCHA3; ISSN: 0021-9258

DT Journal

LA English

AB This study 1st surveys the **antifreeze** activity of the various **antifreeze** components from both *Pagothenia borchgrevinki* and the arginine-containing **antifreeze glycoprotein** from *Eleginus gracilis* (EgAF). All **antifreeze glycoproteins** (AFGP) components examined have a plateau in activity at high concentration, but the actual value of the plateau activity differs between the different length AFGP components and between AFGP and EgAF. Whereas the low-mol.-weight components of both AFGP and EgAF lose activity at deep supercooling, at high concentration activity is restored. The activity data is then shown to

fit

a reversible kinetic model of AFGP activity, and the coeffs. obtained are used to compare the activity differences between AFGP components and between AFGP and EgAF. The model is also shown to describe the activity of the **antifreeze protein** of the fish *Pseudopleuronectes americanus* and the **thermal hysteresis protein** of the insect *Tenebrio molitor*.

L90 ANSWER 82 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1985:467024 HCPLUS

DN 103:67024

TI Direct evidence for **antifreeze glycoprotein** adsorption onto an **ice** surface

AU Brown, Robert A.; Yeh, Yin; Burcham, Timothy S.; Feeney, Robert E.
 CS Dep. Appl. Sci., Univ. California, Davis, CA, 95616, USA
 SO Biopolymers (1985), 24(7), 1265-70
 CODEN: BIPMAA; ISSN: 0006-3525

DT Journal

LA English

AB Enhanced surface-second-harmonic generation (SSHG) was observed in the presence of an active **antifreeze glycoprotein** (AFGP) solution in contact with a pure single crystal of ice. The enhancement of SSHG is a pos. indication that active AFGP mols. adsorb to the surface of ice crystals.

L90 ANSWER 83 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1985:21651 HCPLUS

DN 102:21651

TI Further studies on the involvement of the circadian system in photoperiodic control of **antifreeze protein** production in the beetle *Dendroides canadensis*

AU Horwath, Kathleen L.; Duman, John G.

CS Dep. Biol., Univ. Notre Dame, Notre Dame, IN, 46556, USA

SO Journal of Insect Physiology (1984), 30(12), 947-55

CODEN: JIPHAF; ISSN: 0022-1910

DT Journal

LA English

AB *D. canadensis* Larvae were exposed to environmental light cycle periods close to the period length of the endogenous circadian oscillator. The following light cycles were employed: light/dark 8/13, 8/14, 8/16, 8/18, and 8/19 corresponding to period lengths of 21, 22, 24, 26, and 27 h, resp. Larvae maintained in cycles \leq 24 h displayed a characteristic short-day response, showing greater **antifreeze protein** activity than did those measured on the day of collection in late summer. In contrast, a long-day response was observed in larvae maintained under a 26- or 27-h light cycle in that **antifreeze protein** activity did not differ from that measured on the initial collection date. The role of photoperiod and temperature in influencing the photoperiodic timing processes were examined with a series of resonance expts. The 1st group consisted of a 24, 36, 48, 60, or 72-h light cycle, each with an 8-h photophase at temps. of 20 or 17°. Rhythmic increases in **antifreeze protein** levels at intervals of 24 h occurred under both temps. However, the lower temperature displaced the resonance curve in the vertical direction (i.e. increasing percentage population response) and reduced the difference between peaks and troughs on the resonance curve. Resonance expts. incorporating a 14-h photophase resulted in low **antifreeze protein** activity under all conditions except a 36-h light cycle in which a 67% induction was observed. Eight-hour resonance expts. were also conducted with *D. canadensis* collected in early spring to determine whether the circadian system participates in the photoperiodic timing processes influencing the spring termination of **antifreeze protein** production. Pos. resonance results were obtained in that only larvae maintained in cycles of 36 and 60 h displayed lower **antifreeze** activity when compared to animals on the initial collection date. The combined results emphasize the involvement of the circadian system in the photoperiodic control of **antifreeze protein** production by *D. canadensis* during the fall and spring. Furthermore, the induction of **antifreeze protein** production is a function of light cycle and its waveform (photoperiod).

Temperature

appears to modify the photoperiodic response in some manner involving the photoperiodic time measuring processes. Evidently the photoperiodic response of **antifreeze protein** production by *D. canadensis* is dependent on the entrainment of the circadian system by the light cycle.

L90 ANSWER 84 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1984:468059 HCPLUS
 DN 101:68059
 TI **Antifreeze glycoproteins: influence of polymer length and ice crystal habit on activity**
 AU Burcham, Timothy S.; Knauf, Michael J.; Osuga, David T.; Feeney, Robert E.; Yeh, Yin
 CS Dep. Food Sci. Technol., Univ. California, Davis, CA, 95616, USA
 SO Biopolymers (1984), 23(7), 1379-95
 CODEN: BIPMAA; ISSN: 0006-3525
 DT Journal
 LA English
 AB The effect of the ice crystalline habit and the length of the polymer on the ability of the **antifreeze glycoproteins (AFGP)** from polar fish to depress the **freezing** temperature of H₂O was investigated. The low-mol.-weight components of the **glycoproteins, AFGP** 6-8, are inactive on nucleation at -6°, whereas a **solution** of large **AFGP** (1-4) is fully functional under the same conditions. The low-mol.-weight components differ from the high-mol.-weight components in that they contain some proline replacing the alanine in the Ala-Ala-Thr-disaccharide polymer unit. In the present expts., **antifreeze** activity was examined in the presence of 2 different ice crystal growth habits, and homodimers of **AFGP** 6 and 8 were prepared to investigate the function of polymer length and type on **antifreeze** activity at different degrees of supercooling. **Ice crystal** growth habit and introduction of proline into the polymer unit may be responsible for the loss of activity at deep supercooling (-6°) of **AFGP** 6-8. The loss in the ability of **AFGP** to depress the **freezing** temperature of water at deep supercooling is not solely due to polymer length, as carbodiimide-linked dimers of **AFGP** 6 do not function under these **freezing** conditions. A model of **antifreezing** action based on Langmuirian adsorption of **AFGP** on the **ice** surface and direct competition between H₂O and **AFGP** mols. for the incorporation sites in the **ice crystal** lattice is presented.

L90 ANSWER 85 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1984:100238 HCPLUS
 DN 100:100238
 TI Photoperiodic and **thermal** regulation of **antifreeze protein** levels in the beetle *Dendroides canadensis*
 AU Horwath, Kathleen L.; Duman, John G.
 CS Dep. Biol., Univ. Notre Dame, Notre Dame, IN, 46556, USA
 SO Journal of Insect Physiology (1983), 29(12), 907-17
 CODEN: JIPHAF; ISSN: 0022-1910
 DT Journal
 LA English
 AB The importance of photoperiod, temperature, and their interaction in controlling the seasonal pattern of hemolymph **antifreeze protein** levels in larvae of the beetle *D. canadensis* was investigated. A complete photoperiodic response curve for **antifreeze protein** production was generated at 20° with larvae collected in early fall. Individuals exposed to a ≤10-h photoperiod or constant darkness had **antifreeze** levels elevated over those maintained in a ≥11-h photoperiod or constant light. The critical daylength resulting in 50% population response lies between 11 h light:13 h dark and 10 h light:14 h dark. This photoperiodic response was masked at sufficiently low (threshold between 15° and 10°) and high (threshold between 25° and 30°) temps. Partial photoperiodic response curves

(at 17° and 25°) obtained within this specified temperature range indicate that the position of the critical photoperiod (between 10 and 11 h) is stable, whereas the amplitude of the response curve is temperature dependent.

Expts. investigating the mechanisms controlling the spring depletion of protein antifreeze levels suggest that both photoperiod and temperature are important. The dominant response of photoperiod in the fall, along with the modifying effects of temperature, are considered to provide

the necessary precision to assure adequate cold tolerance early in the fall and the flexibility to protect the species from yearly variation in weather conditions.

L90 ANSWER 86 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1983:555643 HCPLUS
 DN 99:155643
 TI Induction of antifreeze protein production by juvenile hormone in larvae of the beetle, *Dendroides canadensis*
 AU Horwath, Kathleen L.; Duman, John G.
 CS Dep. Biol., Univ. Notre Dame, Notre Dame, IN, 46556, USA
 SO Journal of Comparative Physiology (1983), 151(2), 233-40
 CODEN: JRCPA3; ISSN: 0373-0859
 DT Journal
 LA English
 AB Larvae of *D. canadensis* accumulate protein antifreezes during the winter. *D. canadensis* which were collected in the early fall, prior to the initiation of cold hardening processes, were treated with either 3.3 or 6.6 µg juvenile hormone I topically and maintained for 21 days under normally noninductive acclimation conditions (16 h light/8 h dark, 20°). Hormone-treated animals elevated the levels of antifreeze protein in their hemolymph compared to those of controls or animals measured on the day of collection. *D. canadensis* treated with the anti-JH compound precocene II (P2) for 24 h at 20 µg/cm² (a dose below LD₅₀ for behavioral survival) and then maintained under acclimation conditions conducive to antifreeze protein production (8 h light/16 h dark, 20°) for 2 wk failed to elevate levels of antifreeze. Control animals accumulated antifreeze protein. *D. canadensis* were also treated with 20 and 150 µg P2/cm² (a dose below the LD₅₀ for gross survival) followed by acclimation to short (8 h) photoperiod at 10°. All animals receiving the higher P2 dosage failed to elevate antifreezes, whereas only 42.9% of the individuals treated with the lower dosage initiated antifreeze protein production. In contrast, >80% of untreated controls responded to these inductive acclimation conditions by elevating antifreeze concns. Thus, juvenile hormone participates in the seasonal control of antifreeze protein production in *D. canadensis*. Since this species does not enter diapause prior to or throughout the winter, this is the 1st evidence establishing a direct hormonal mechanism involved with insect cold hardiness.

L90 ANSWER 87 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1982:157658 HCPLUS
 DN 96:157658
 TI Purification and composition of protein antifreezes with high cysteine contents from larvae of the beetle, *Tenebrio molitor*
 AU Patterson, Jean L.; Duman, John G.
 CS Biol. Dep., Univ. Notre Dame, South Bend, IN, 46556, USA
 SO Journal of Experimental Zoology (1982), 219(3), 381-4
 CODEN: JEZOAO; ISSN: 0022-104X
 DT Journal
 LA English

AB Two antifreeze proteins with thermal hysteresis activity (they depress the f.p. of aqueous solns. by a noncolligative mechanism well below the m.p.) were purified from cold-acclimated larvae of the beetle, *T. molitor*. Both proteins have unusual amino acid compns. consisting of high levels of cysteine (15.4 and 28.0 mol%).

L90 ANSWER 88 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1982:101220 HCPLUS

DN 96:101220

TI Involvement of the circadian system in photoperiodic regulation of insect antifreeze proteins

AU Horwath, Kathleen L.; Duman, John G.

CS Dep. Biol., Univ. Notre Dame, Notre Dame, IN, 46556, USA

SO Journal of Experimental Zoology (1982), 219(2), 267-70

CODEN: JEZOAO; ISSN: 0022-104X

DT Journal

LA English

AB Several species of insects produce proteins in the winter that depress the hemolymph freezing and supercooling points thereby functioning as antifreezes. These proteins produce a thermal hysteresis (difference between the freezing and m.ps.). The environmental and physiol. mechanisms that regulate the seasonal production of antifreeze proteins in the beetle, *Dendroides canadensis* were studied. Larvae collected in early fall from a natural population and acclimated to a short photoperiod (8 h light (L)/16 h dark (D) at 20°, 90% RH) elevated levels of thermal hysteresis proteins, whereas those individuals maintained on a long (16L/8D) photoperiod did not. Resonance expts. showed that circadian rhythmicity is involved in the photoperiodic timing mechanism used by *Dendroides* to control antifreeze production. Apparently, an important aspect of insect seasonality, i.e., winter hardening, includes complex biol. timing processes of circadian nature.

L90 ANSWER 89 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1982:64429 HCPLUS

DN 96:64429

TI Purification, composition, and physical properties of a thermal hysteresis "antifreeze" protein from larvae of the beetle *Tenebrio molitor*

AU Tomchaney, A. P.; Morris, J. P.; Kang, S. H.; Duman, J. G.

CS Dep. Biol., Univ. Notre Dame, Notre Dame, IN, 46556, USA

SO Biochemistry (1982), 21(4), 716-21

CODEN: BICHAW; ISSN: 0006-2960

DT Journal

LA English

AB A thermal hysteresis protein was purified from cold-acclimated larvae of the beetle, *T. molitor*, by using ETOH fractionation, DEAE ion-exchange chromatog., gel filtration, and high-pressure liquid chromatog. The purified protein had a mol. weight of 17,000 daltons and its N-terminus was lysine. The amino acid composition of the antifreeze protein contained more hydrophilic amino acids than the fish antifreezes. This is consistent with the compns. of previously purified insect thermal hysteresis proteins. However, the percentage of hydrophilic amino acids in this *Tenebrio* antifreeze protein was considerably less than that of other insect thermal hysteresis proteins. The f.p. depressing activity of the *Tenebrio* antifreeze was less than that of fish proteins and glycoproteins at low protein concns. but was greater at high protein concns.

L90 ANSWER 90 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1981:456738 HCPLUS
 DN 95:56738
 TI Purification and composition of a **thermal hysteresis**
 producing protein from the milkweed bug, *Oncopeltus fasciatus*
 AU Patterson, Jean L.; Kelly, Thomas J.; Duman, John G.
 CS Dep. Biol., Univ. Notre Dame, Notre Dame, IN, 46556, USA
 SO Journal of Comparative Physiology (1981), 142(4), 539-42
 CODEN: JRCPA3; ISSN: 0373-0859
 DT Journal
 LA English
 AB A protein which produces a **thermal hysteresis**
 (a difference between the freezing pt and m.ps.) was purified from the
 hemolymph of the milkweed bug, *O. fasciatus*. The amino acid composition of the
Oncopeltus thermal hysteresis protein is
 somewhat different from that of the larvae of the beetle, **Tenebrio molitor**, which is the only other insect from which such a
 protein has been purified. The major difference between the 2 is
 the large amount of serine (30.5% of the amino acid residues) and glycine
 (20.0%) present in the *O. fasciatus* protein. Both insect
 proteins have a composition which consists of .apprx.60% polar amino
 acids and lacks large amts. of alanine. In these respects, they are quite
 different from the fish **antifreeze glycoproteins**. The
 apparent differences in the structure of the **thermal hysteresis proteins** and the **antifreeze glycoproteins** indicates that these proteins have evolved
 independently and therefore offer an interesting example of convergent
 evolution.

L90 ANSWER 91 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1981:98222 HCPLUS
 DN 94:98222
 TI Isolation and characterization of freezing-point-depressing peptides from
 larvae of **Tenebrio molitor**
 AU Schneppenheim, R.; Theede, H.
 CS Inst. Meereskd., Univ. Kiel, Kiel, D-2300/1, Fed. Rep. Ger.
 SO Comparative Biochemistry and Physiology, Part B: Biochemistry & Molecular
 Biology (1980), 67B(4), 561-8
 CODEN: CBPBB8; ISSN: 0305-0491
 DT Journal
 LA English
 AB F.p. depressing peptides isolated from **T. molitor** larvae acclimated to low temperature (-1°) showed a
 thermal hysteresis similar to that of **antifreeze glycoproteins** or **proteins** from Antarctic and Arctic
 fish; however, they differed in composition and mechanism of f.p. depression.
 A cooperative functioning between single peptides was necessary
 for a high f.p. depressing activity. A high cysteine content was found in
 the new peptides and SS bonds were essential for activity. A
 high share of hydrophilic amino acids (asparagine, threonine, serine)
 resulted in a high capacity to bind water. This feature may be important
 both for the high resistance to dehydration and for protection against
 freezing.

L90 ANSWER 92 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1981:42905 HCPLUS
 DN 94:42905
 TI Isopiestic determination of water binding by **fish antifreeze glycoproteins**
 AU Duman, John G.; Patterson, Jean L.; Kozak, John J.; De Vries, Arthur L.
 CS Dep. Biol., Univ. Notre Dame, Notre Dame, IN, 46556, USA
 SO Biochimica et Biophysica Acta (1980), 626(2), 332-6
 CODEN: BBACAO; ISSN: 0006-3002
 DT Journal

LA English

AB The effectiveness of water binding of **fish antifreeze glycoproteins** relative to Hb, cytochrome c, and polyvinylpyrrolidinone was determined by analyzing results obtained in an isopiestic study at 25°. The net weight of water which moved from a protein/NaCl aqueous sample to a saturated NaCl reference solution increased in the order: **antifreeze glycoprotein**, Hb, polyvinylpyrrolidinone, and cytochrome c. Since, of the proteins studies, the **glycoproteins** were least effective in transporting water, the **glycoproteins** are the most effective in binding water under equilibrium conditions at 25°.

L90 ANSWER 93 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1980:143647 HCPLUS

DN 92:143647

TI The role of **thermal hysteresis** producing **proteins** and **glycoproteins** in **Tenebrio molitor** larvae

AU Patterson, Jean L.

CS Univ. Notre Dame, Notre Dame, IN, USA

SO (1979) 98 pp. Avail.: Univ. Microfilms Int., Order No. 8002622
From: Diss. Abstr. Int. B 1980, 40(7), 2961

DT Dissertation

LA English

AB Unavailable

L90 ANSWER 94 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1980:106114 HCPLUS

DN 92:106114

TI **Antifreeze glycoproteins** from **polar fish**.
Effects of **freezing** conditions on cooperative function

AU Mulvihill, Daniel M.; Geoghegan, Kieran F.; Yeh, Yin; DeRemer, Kenneth; Osuga, David T.; Ward, Fred C.; Feeney, Robert E.

CS Dep. Food Sci. Technol., Univ. California, Davis, CA, 95616, USA

SO Journal of Biological Chemistry (1980), 255(2), 659-62
CODEN: JBCHA3; ISSN: 0021-9258

DT Journal

LA English

AB **Antifreeze glycoproteins** and **glycopeptides** that function noncolligatively contribute 1/3 of the **freezing** temperature depression in the blood serum of some **polar fishes** and enable them to survive at low temps. (-1.9°). There were ≥8 closely related **glycoproteins** and **glycopeptides** ranging in mol. weight from 32,000 to 2600 and numbered 1 to 8 in order of decreasing size. Under conditions of negligible supercooling, the **glycopeptides** had weaker **antifreeze** activity than did the **glycoproteins** (20% on a weight basis or 5% on a molar basis); in mixts. of both, their activities were additive. When nucleation was initiated in supercooled **solns.** (-4 to -5°), the **glycopeptides** were inactive, whereas the **glycoproteins** still showed activity; when mixts. of both were nucleated in supercooled **solns.**, cooperative potentiation occurred, and the full activities of the **glycopeptides** were found. On nucleation of supercooled **solns.** of the **glycoprotein** alone or of the mixts., the temperature rose above the **freezing** temperature (overshoots) to an extent dependent on the extent of supercooling; the temperature of the sample then decreased to form a plateau at the true **freezing** temperature

L90 ANSWER 95 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1980:38064 HCPLUS

DN 92:38064

TI Composition of a **protein antifreeze** from larvae of the beetle, **Tenebrio molitor**

AU Patterson, Jean L.; Duman, John G.
 CS Biol. Dep., Univ. Notre Dame, Notre Dame, IN, 46556, USA
 SO Journal of Experimental Zoology (1979), 210(2), 361-7
 CODEN: JEZOAO; ISSN: 0022-104X
 DT Journal
 LA English
 AB A thermal hysteresis-producing antifreeze protein was isolated from larvae of *T. molitor*. This is the 1st thermal hysteresis protein purified from an insect. The specific activity of the *Tenebrio* antifreeze was somewhat greater than that of fish. The composition of the *Tenebrio* protein was quite different from those of the fish protein antifreezes. The most obvious difference was the lack of a large alanine component in the *Tenebrio* antifreeze

L90 ANSWER 96 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1976:473747 HCPLUS
 DN 85:73747
 TI Compartmentalization of sodium chloride in frozen solutions of antifreeze glycoproteins
 AU Lin, Y.; Raymond, J. A.; Duman, J. G.; DeVries, A. L.
 CS Scripps Inst. Oceanogr., Univ. California, La Jolla, CA, USA
 SO Cryobiology (1976), 13(3), 334-40
 CODEN: CRYBAS; ISSN: 0011-2240
 DT Journal
 LA English
 AB The freezing behavior of NaCl solns. containing antifreeze glycoproteins from an Antarctic fish was investigated to determine whether the glycoproteins prevent concentration of NaCl during freezing. Frozen NaCl solns. containing glycoproteins exhibited greater resistance to releasing their brine during centrifugation than NaCl solns. containing other cryoprotectants. With the aid of calorimetry this was shown to be caused not by an incorporation of the NaCl into the ice but by compartmentalization of the brine pockets. The compartmentalization was attributed to an unusual spicular structure that was imposed on the ice by glycoproteins.

L90 ANSWER 97 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1976:415636 HCPLUS
 DN 85:15636
 TI Raman spectra of a solid antifreeze glycoprotein and its liquid and frozen aqueous solutions
 AU Tomimatsu, Yoshio; Scherer, James R.; Yeh, Yin; Feeney, Robert E.
 CS West. Reg. Res. Cent., ARS, Berkeley, CA, USA
 SO Journal of Biological Chemistry (1976), 251(8), 2290-8
 CODEN: JBCHA3; ISSN: 0021-9258
 DT Journal
 LA English
 AB Raman spectroscopy was used to study the anomalous decrease in the freezing temperature of water produced by an antifreeze glycoprotein obtained from the sera of an Antarctic fish. An active fraction of this glycoprotein has a mol. weight of apprx. 18,000 by equilibrium sedimentation compared to an apparent weight of

20 by freezing temperature depression. The Raman spectra of water present in a 1% antifreeze glycoprotein solution and of ice frozen from this solution were indistinguishable from the spectra of pure water and ice, resp. Thus, the bulk properties of water and ice are unaffected by the presence of the antifreeze glycoprotein. Raman measurements on ice grown slowly, using as seed an oriented

single crystal of ice in contact with 1% **glycoprotein solns.**, showed that the active **glycoprotein** was not excluded from the ice phase. On the other hand, a smaller, inactive **glycoprotein** was excluded. Comparison of the Raman spectra of active and inactive **glycoprotein** components as solids, in 5% **solns.**, and rapidly frozen 5% **solns.**, showed that the 2 components differ in conformation and possibly in the environment of their carbohydrate hydroxyls. These observations suggest that H bonding of the carbohydrate hydroxyls of the active **glycoprotein** at the ice-solution interface may phys. prevent growth of the ice lattice.

L90 ANSWER 98 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1973:475121 HCPLUS
 DN 79:75121
 TI Freezing behavior of fish blood **glycoproteins** with **antifreeze** properties
 AU Raymond, J. A.; DeVries, A. L.
 CS Scripps Inst. Oceanogr., Univ. California, La Jolla, CA, USA
 SO Cryobiology (1972), 9(6), 541-7
 CODEN: CRYBAS; ISSN: 0011-2240
 DT Journal
 LA English
 AB The blood of some species of antarctic **fishes** contains freezing point-depressing **glycoproteins**, ranging in mol. weight from 300 to 34,000 daltons. In aqueous **solns.** undergoing freezing, the **glycoproteins** of *T rematomus borchgrevinki* and *Dissostichus mawsoni* were incorporated into the ice in a concentration identical to that in the liquid. The freezing point depression (fpd) was related to the size of the **glycoprotein**, and for the smaller sizes, was also dependent on the rate of freezing. Supercooling of the serum in the presence of an ice seed was also observed. Thus, the fpd caused by the **glycoproteins** is a noncolligative property. A mechanism for the fpd involving surface effects on ice is suggested.

L90 ANSWER 99 OF 99 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1973:450919 HCPLUS
 DN 79:50919
 TI Depression of freezing point by **glycoproteins** from an Antarctic **fish**
 AU Feeney, R. E.; Hofmann, R.
 CS Lab. Festkoerperphys., Eidg. Tech. Hochsch., Zurich, Switz.
 SO Nature (London, United Kingdom) (1973), 243(5406), 357-9
 CODEN: NATUAS; ISSN: 0028-0836
 DT Journal
 LA English
 AB Using the blood sera of 2 species of Antarctic **fish**, *Trematous borchgrevinki* and *Dissostichus mawsoni*, the rates of development of **ice crystals** and possible equilibria between the **ice crystals** and aqueous phases were examined, using differential thermal analysis (DTA) and direct microscopic observations of freezing and melting, resp. The **antifreeze glycoproteins (AFGP)** were purified from *T. borchgrevinki* serum. **Ice** formed in a **solution** of **AFGP** seemed to be normal **ice**, i.e., it melted at 0°. **Freezing** and melting of **AFGP solns** occurred at rates similar to those at which water **freezes** and melts when equivalent amts. of **heat** were applied or removed at the resp. melting or freezing temps. Thus there was no evidence indicating a comparatively rapid development of **crystals** in **AFGP solns**. It was not possible to prove a mechanism

involving nucleation from the DTA expts. on kinetic effects. There were no unusual supercooling effects as are commonly found in solns. in which initiation of freezing is very slow in the absence of crystals. There is no significant kinetic effect involved in the overall freezing mechanism. Models are discussed.

=> => fil biosis

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L107 ANSWER 1 OF 8 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN
AN 1993:111461 BIOSIS
DN PREV199344053861
TI Histochemistry and antifreeze protein activity of
early primary cultures of cells derived from the fat body of *Tenebrio*
molitor.
AU Easton, C. M.; Horwath, K. L.
CS Dep. Biol. Sci., Univ. Cent. Binghamton, State Univ. N.Y., Binghamton,
N.Y. 13902-6000, USA
SO Cryobiology, (1992) Vol. 29, No. 6, pp. 729.
Meeting Info.: Twenty-ninth Annual Meeting of the Society for Cryobiology.
Ithaca, New York, USA. June 14-19, 1992.
CODEN: CRYBAS. ISSN: 0011-2240.
DT Conference; (Meeting)
LA English
ED Entered STN: 16 Feb 1993
Last Updated on STN: 16 Feb 1993
CC General biology - Symposia, transactions and proceedings 00520
Microscopy - Histology and histochemistry 01056
Cytology - Animal 02506
Biochemistry studies - General 10060
Biochemistry studies - Proteins, peptides and amino acids 10064
Biophysics - Molecular properties and macromolecules 10506
External effects - Temperature as a primary variable - cold 10616
Anatomy and Histology - Microscopic and ultramicroscopic anatomy 11108
Metabolism - Proteins, peptides and amino acids 13012
Bones, joints, fasciae, connective and adipose tissue - Physiology and
biochemistry 18004
Temperature - General measurement and methods 23001
Temperature - Cryobiology 23004
Invertebrata: comparative, experimental morphology, physiology and
pathology - Insecta: physiology 64076
Invertebrate body regions - Special organs 64218
IT Major Concepts
Biochemistry and Molecular Biophysics; Cell Biology; Metabolism;
Methods and Techniques; Morphology; Physiology; Skeletal System
(Movement and Support)
IT Miscellaneous Descriptors
ABSTRACT; CRYOBIOLOGY
ORGN Classifier
Coleoptera 75304
Super Taxa

Insecta; Arthropoda; Invertebrata; Animalia
Organism Name
Tenebrio molitor
Taxa Notes
Animals, Arthropods, Insects, Invertebrates

L107 ANSWER 2 OF 8 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN
AN 1991:131136 BIOSIS
DN PREV199140062821; BR40:62821
TI ANTIFREEZE PROTEIN PRODUCTION IN PRIMARY CELL CULTURES
OF TENEBRIOS-MOLITOR FAT BODY.
AU EASTON C [Reprint author]; HORWATH K O
CS CENT CRYOBIOL RES, STATE UNIV NY, BINGHAMTON, NY 13901, USA
SO Cryobiology, (1990) Vol. 27, No. 6, pp. 660-661.
Meeting Info.: TWENTY-SEVENTH ANNUAL MEETING OF THE SOCIETY FOR
CRYOBILOGY AND THE CRYOGENIC SOCIETY OF AMERICA, BINGHAMTON, NEW YORK,
USA, JUNE 17-23, 1990. CRYOBILOGY.
CODEN: CRYBAS. ISSN: 0011-2240.
DT Conference; (Meeting)
FS BR
LA ENGLISH
ED Entered STN: 7 Mar 1991
Last Updated on STN: 7 Mar 1991
CC General biology - Symposia, transactions and proceedings 00520
Cytology - Animal 02506
Biochemistry studies - Proteins, peptides and amino acids 10064
Biochemistry studies - Lipids 10066
External effects - Temperature as a primary variable - cold 10616
Metabolism - Proteins, peptides and amino acids 13012
Bones, joints, fasciae, connective and adipose tissue - Physiology and
biochemistry 18004
Temperature - General measurement and methods 23001
Temperature - Cryobiology 23004
Temperature - Thermoregulation 23012
Tissue culture, apparatus, methods and media 32500
Invertebrates: comparative, experimental morphology, physiology and
pathology - Insecta: physiology 64076
IT Major Concepts
Cell Biology; Metabolism; Physiology; Skeletal System (Movement and
Support)
IT Miscellaneous Descriptors
ABSTRACT CRYOBILOGY
ORGN Classifier
Coleoptera 75304
Super Taxa
Insecta; Arthropoda; Invertebrata; Animalia
Taxa Notes
Animals, Arthropods, Insects, Invertebrates

L107 ANSWER 3 OF 8 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN
AN 1991:131135 BIOSIS
DN PREV199140062820; BR40:62820
TI REGULATION OF INSECT COLD HARDINESS AN IN-VITRO APPROACH.
AU HORWATH K L [Reprint author]
CS CENT CRYOBIOL RES, STATE UNIV NEW YORK, BINGHAMTON, NY 13901, USA
SO Cryobiology, (1990) Vol. 27, No. 6, pp. 660.
Meeting Info.: TWENTY-SEVENTH ANNUAL MEETING OF THE SOCIETY FOR
CRYOBILOGY AND THE CRYOGENIC SOCIETY OF AMERICA, BINGHAMTON, NEW YORK,
USA, JUNE 17-23, 1990. CRYOBILOGY.
CODEN: CRYBAS. ISSN: 0011-2240.
DT Conference; (Meeting)
FS BR
LA ENGLISH

ED Entered STN: 7 Mar 1991
 Last Updated on STN: 7 Mar 1991

CC General biology - Symposia, transactions and proceedings 00520
 Ecology: environmental biology - Bioclimatology and biometeorology 07504
 Ecology: environmental biology - Animal 07508
 Biochemistry methods - Proteins, peptides and amino acids 10054
 Biochemistry studies - Proteins, peptides and amino acids 10064
 External effects - Temperature as a primary variable - cold 10616
 Metabolism - Proteins, peptides and amino acids 13012
 Temperature - General measurement and methods 23001
 Temperature - Cryobiology 23004
 Temperature - Thermoregulation 23012
 In vitro cellular and subcellular studies 32600
 Invertebrata: comparative, experimental morphology, physiology and pathology - Insecta: physiology 64076

IT Major Concepts
 Climatology (Environmental Sciences); Ecology (Environmental Sciences); Metabolism; Physiology

IT Miscellaneous Descriptors
 ABSTRACT DENDROIDES-CANADENSIS TENEBRIOS-MOLITOR ANTIFREEZE
 PROTEIN CRYOBIOLOGY

ORGN Classifier
 Coleoptera 75304
 Super Taxa
 Insecta; Arthropoda; Invertebrata; Animalia
 Taxa Notes
 Animals, Arthropods, Insects, Invertebrates

L107 ANSWER 4 OF 8 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN
 AN 1986:369167 BIOSIS
 DN PREV198631064441; BR31:64441
 TI CONTROL OF GROWTH AND DIFFERENTIATION OF THE DERMAL GLANDS VERSO'S GLANDS OF MANDUCA-SEXTA.
 AU HORWATH K L [Reprint author]; RIDDIFORD L M
 CS UNIV WASH, SEATTLE, WA 98195, USA
 SO Journal of Cellular Biochemistry Supplement, (1986) No. 10 PART C, pp. 82. Meeting Info.: SYMPOSIUM ON MOLECULAR ENTOMOLOGY HELD AT THE 15TH ANNUAL MEETING OF THE UCLA (UNIVERSITY OF CALIFORNIA-LOS ANGELES) SYMPOSIA ON MOLECULAR AND CELLULAR BIOLOGY, MAR. 20-APR. 6, 1986. J CELL BIOCHEM SUPPL.
 ISSN: 0733-1959.
 DT Conference; (Meeting)
 FS BR
 LA ENGLISH
 ED Entered STN: 12 Sep 1986
 Last Updated on STN: 12 Sep 1986

CC General biology - Symposia, transactions and proceedings 00520
 Cytology - Animal 02506
 Biochemistry studies - Proteins, peptides and amino acids 10064
 Metabolism - Proteins, peptides and amino acids 13012
 Endocrine - General 17002
 Endocrine - Neuroendocrinology 17020
 Integumentary system - Physiology and biochemistry 18504
 Development and Embryology - Morphogenesis 25508
 In vitro cellular and subcellular studies 32600
 Invertebrata: comparative, experimental morphology, physiology and pathology - Insecta: physiology 64076
 Invertebrate body regions - Special organs 64218

IT Major Concepts
 Biochemistry and Molecular Biophysics; Development; Endocrine System (Chemical Coordination and Homeostasis); Integumentary System (Chemical Coordination and Homeostasis); Metabolism; Physiology

IT Miscellaneous Descriptors

ABSTRACT ECDYSIS JUVENILE HORMONE ECDYSTEROID PUPAL PROTEIN
SYNTHESIS

ORGN Classifier

Lepidoptera 75330

Super Taxa

Insecta; Arthropoda; Invertebrata; Animalia

Taxa Notes

Animals, Arthropods, Insects, Invertebrates

L107 ANSWER 5 OF 8 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN
AN 1985:71554 BIOSIS

DN PREV198528071554; BR28:71554

TI THERMOPERIODIC REGULATION OF INSECT ANTIFREEZE
PROTEINS.

AU HORWATH K L [Reprint author]; DUMAN J G

CS DEP ZOOL, UNIV WASH, SEATTLE, WA 98105, USA

SO Cryobiology, (1984) Vol. 21, No. 6, pp. 686-687.

Meeting Info.: 21ST ANNUAL MEETING OF THE SOCIETY FOR CRYOBIOLOGY, SAN DIEGO, CALIF., USA, AUG. 21-24, 1984. CRYOBIOLOGY.

CODEN: CRYBAS. ISSN: 0011-2240.

DT Conference; (Meeting)

FS BR

LA RUSSIAN

CC General biology - Symposia, transactions and proceedings 00520
Biochemistry studies - Proteins, peptides and amino acids 10064
External effects - Temperature as a primary variable - cold 10616
Metabolism - Proteins, peptides and amino acids 13012
Temperature - General measurement and methods 23001
Temperature - Cryobiology 23004
Temperature - Thermoadaptation 23010
Invertebrata: comparative, experimental morphology, physiology and
pathology - Insecta: physiology 64076

IT Major Concepts

Metabolism; Physiology

IT Miscellaneous Descriptors

ABSTRACT DENDROIDES-CANADENSIS

ORGN Classifier

Coleoptera 75304

Super Taxa

Insecta; Arthropoda; Invertebrata; Animalia

Taxa Notes

Animals, Arthropods, Insects, Invertebrates

L107 ANSWER 6 OF 8 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN

AN 1984:17350 BIOSIS

DN PREV198426017350; BR26:17350

TI THE ROLE OF HEMOLYMPH PROTEINS IN THE COLD TOLERANCE
OF INSECTS.

AU DUMAN J [Reprint author]; HORWATH K

CS BIOL DEP, UNIV NOTRE DAME, NOTRE DAME, IN 46556, USA

SO Annu. Rev. Physiol., (1983) pp. P261-270. BERNE, R. M. (ED.). ANNUAL
REVIEW OF PHYSIOLOGY, VOL. 45. XIV+710P. ANNUAL REVIEWS, INC.: PALO ALTO,
CALIF., USA. ILLUS.

Publisher: Series: Annual Review of Physiology.

CODEN: ARPHAD. ISSN: 0066-4278. ISBN: 0-8243-0345-8.

DT Book

FS BR

LA ENGLISH

CC Biochemistry studies - Proteins, peptides and amino acids 10064

Biophysics - Molecular properties and macromolecules 10506

External effects - Temperature as a primary variable - cold 10616

Physiology - Comparative 12003

Metabolism - Proteins, peptides and amino acids 13012

Temperature - Cryobiology 23004
 Temperature - Thermopathology 23007
 Invertebrata: comparative, experimental morphology, physiology and pathology - Arthropoda: chelicerata 64060
 Invertebrata: comparative, experimental morphology, physiology and pathology - Insecta: physiology 64076

IT Major Concepts

Metabolism; Pathology; Physiology

IT Miscellaneous Descriptors

REVIEW TENEBRIO-MOLITOR MERACANTHA-CONTRACTA PARCOBLATTA-PENNSYLVANICA
 ONCOPELTUS-FASCIATUS BOREUS-WESTWOODI ULOMA-IMPRESSA
 DENDROIDES-CANADENSIS PHILODROMUS VESPULA-MACULATA FISH THERMAL
 HYSTERESIS PROTEIN ICE NUCLEATOR PROTEIN

ORGN Classifier

Coleoptera 75304

Super Taxa

Insecta; Arthropoda; Invertebrata; Animalia

Taxa Notes

Animals, Arthropods, Insects, Invertebrates

ORGN Classifier

Heteroptera 75322

Super Taxa

Insecta; Arthropoda; Invertebrata; Animalia

Taxa Notes

Animals, Arthropods, Insects, Invertebrates

ORGN Classifier

Hymenoptera 75326

Super Taxa

Insecta; Arthropoda; Invertebrata; Animalia

Taxa Notes

Animals, Arthropods, Insects, Invertebrates

ORGN Classifier

Mecoptera 75334

Super Taxa

Insecta; Arthropoda; Invertebrata; Animalia

Taxa Notes

Animals, Arthropods, Insects, Invertebrates

ORGN Classifier

Arachnida 75402

Super Taxa

Chelicerata; Arthropoda; Invertebrata; Animalia

Taxa Notes

Animals, Arthropods, Chelicerates, Invertebrates

ORGN Classifier

Pisces 85200

Super Taxa

Vertebrata; Chordata; Animalia

Taxa Notes

Animals, Chordates, Fish, Nonhuman Vertebrates, Vertebrates

L107 ANSWER 7 OF 8 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN

AN 1983:83441 BIOSIS

DN PREV198325008441; BR25:8441

TI CONTROL OF PHOTOPERIODICALLY INDUCED ANTIFREEZE PROTEIN
 PRODUCTION IN THE COLD HARDY BEETLE DENDROIDES-CANADENSIS.

AU HORWATH K L [Reprint author]; DUMAN J G

CS DEP BIOL, UNIV NOTRE DAME, NOTRE DAME, IN 46556, USA

SO Federation Proceedings, (1983) Vol. 42, No. 3, pp. ABSTRACT 1038.

Meeting Info.: 67TH ANNUAL MEETING OF THE FEDERATION OF AMERICAN SOCIETIES
 FOR EXPERIMENTAL BIOLOGY, CHICAGO, ILL., USA, APRIL 10-15, 1983. FED PROC.
 CODEN: FEPRA7. ISSN: 0014-9446.

DT Conference; (Meeting)

FS BR

LA ENGLISH
 CC General biology - Symposia, transactions and proceedings 00520
 Behavioral biology - Animal behavior 07003
 Circadian rhythms and other periodic cycles 07200
 Ecology: environmental biology - Bioclimatology and biometeorology 07504
 Biochemistry studies - General 10060
 Biochemistry studies - Lipids 10066
 External effects - Light and darkness 10604
 Endocrine - Neuroendocrinology 17020
 Temperature - Cryobiology 23004
 Temperature - Thermoadaptation 23010
 Development and Embryology - Morphogenesis 25508
 Invertebrata: comparative, experimental morphology, physiology and pathology - Insecta: physiology 64076

IT Major Concepts
 Behavior; Biosynchronization; Endocrine System (Chemical Coordination and Homeostasis); Physiology

IT Miscellaneous Descriptors
 ABSTRACT WINTER CIRCADIAN RHYTHM JUVENILE HORMONE PREOCENE DIAPAUSE

ORGN Classifier
 Coleoptera 75304
 Super Taxa
 Insecta; Arthropoda; Invertebrata; Animalia
 Taxa Notes
 Animals, Arthropods, Insects, Invertebrates

L107 ANSWER 8 OF 8 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN

AN 1982:72910 BIOSIS

DN PREV198223002902; BR23:2902

TI CIRCADIAN REGULATION OF INSECT DENDROIDES-CANADENSIS ANTIFREEZE PROTEINS.

AU HORWATH K L [Reprint author]; DUMAN J G

CS DEP BIOL, UNIV NOTRE DAME, NOTRE DAME, INDIANA, USA

SO Cryobiology, (1981) Vol. 18, No. 6, pp. 615.

Meeting Info.: 18TH ANNUAL MEETING OF THE SOCIETY FOR CRYOBIOLOGY, ST. LOUIS, MO., USA, JUNE 14-18, 1981. CRYOBIOLOGY.

CODEN: CRYBAS. ISSN: 0011-2240.

DT Conference; (Meeting)

FS BR

LA ENGLISH

CC General biology - Symposia, transactions and proceedings 00520
 Circadian rhythms and other periodic cycles 07200
 Ecology: environmental biology - Animal 07508
 Biochemistry studies - Proteins, peptides and amino acids 10064
 External effects - Light and darkness 10604
 External effects - Temperature as a primary variable - cold 10616
 Metabolism - Proteins, peptides and amino acids 13012
 Temperature - General measurement and methods 23001
 Temperature - Cryobiology 23004
 Temperature - Thermoadaptation 23010
 Invertebrata: comparative, experimental morphology, physiology and pathology - Insecta: physiology 64076

IT Major Concepts
 Biochemistry and Molecular Biophysics; Biosynchronization; Ecology (Environmental Sciences); Physiology

IT Miscellaneous Descriptors
 ABSTRACT PHOTOPERIOD

ORGN Classifier
 Coleoptera 75304
 Super Taxa
 Insecta; Arthropoda; Invertebrata; Animalia
 Taxa Notes
 Animals, Arthropods, Insects, Invertebrates

=> d all tot 1108

L108 ANSWER 1 OF 11 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN
AN 2003:360784 BIOSIS
DN PREV200300360784
TI A serendipitous discovery of antifreeze protein
-specific activity in C-linked antifreeze glycoprotein
analogs.
AU Eniade, Adewale; Purushotham, Madhusudhan; Ben, Robert N. [Reprint
Author]; Wang, J. B.; Horwath, Kathleen
CS Department of Chemistry, State University of New York at Binghamton,
Binghamton, NY, 13902, USA
SO Cell Biochemistry and Biophysics, (2003) Vol. 38, No. 2, pp. 115-124.
print.
ISSN: 1085-9195.
DT Article
LA English
ED Entered STN: 6 Aug 2003
Last Updated on STN: 6 Aug 2003
AB Structurally diverse carbon-linked (C-linked) analogs of
antifreeze glycoprotein (AFGP) have been prepared via
linear or convergent solid phase synthesis. These analogs range in
molecular weight from approx 1.5-4.1 KDa and do not possess the
beta-D-galactose-1,3-alpha-D-N-acetylgalactosamine carbohydrate moiety or
the L-threonine-L-alanine-L-alanine polypeptide backbone native
to the AFGP wild-type. Despite these dramatic structural modifications,
the 2.7-KDa and 4.1-KDa analogs possess antifreeze
protein-specific activity as determined by recrystallization-
inhibition (RI) and thermal hysteresis (TH) assays. These
analogs are weaker than the wild-type in their activity, but nanoliter
osmometry indicates that these compounds are binding to ice and affecting
a localized freezing point depression. This is the first
example of a C-linked AFGP analog that possesses TH and RI activity and
suggests that the rational design and synthesis of chemically and
biologically stable AFGP analogs is a feasible and worthwhile endeavor.
Given the low degree of TH activity, these compounds may prove useful for
the protection of cells during freezing and thawing cycles.
CC Biochemistry studies - General 10060
IT Major Concepts
 Biochemistry and Molecular Biophysics; Methods and Techniques
IT Chemicals & Biochemicals
 C-linked antifreeze glycoprotein analogs; L-lysine;
 L-threonine; antifreeze glycoproteins;
 antifreeze protein; carbon; glycine; glycoconjugate
IT Methods & Equipment
 recrystallization: laboratory techniques
IT Miscellaneous Descriptors
 antifreeze protein-specific activity: serendipitous
 discovery; freezing cycles; thawing cycles; thermal
 hysteresis
RN 56-87-1 (L-lysine)
 72-19-5 (L-threonine)
 7440-44-0 (carbon)
 56-40-6 (glycine)

L108 ANSWER 2 OF 11 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN
AN 1996:538806 BIOSIS
DN PREV199699261162
TI Tracking the profile of a specific antifreeze protein
and its contribution to the thermal hysteresis activity in
cold hardy insects.

AU Horwath, Kathleen L. [Reprint author]; Easton, Christopher M.; Poggioli., George J., Jr.; Myers, Kevin; Schnorr, Ingrid L.
 CS Dep. Biol. Sci., Binghamton Univ., Binghamton, NY 13902-6000, USA
 SO European Journal of Entomology, (1996) Vol. 93, No. 3, pp. 419-433.
 ISSN: 1210-5759.
 DT Article
 LA English
 ED Entered STN: 10 Dec 1996
 Last Updated on STN: 10 Dec 1996
 AB This study summarizes some important new directions in research on **antifreeze protein** biosynthesis and regulation. It describes the recent development and availability of essential biochemical and cellular tools that make possible more direct cellular investigations, and an assessment of the relationship between **thermal hysteresis protein** (THP) levels and **antifreeze activity** (both **thermal hysteresis** and **recrystallization inhibition** (RI)). These tools include: 1) the isolation of a specific THP of high activity (designated T_m 12.86), and an additional endogenous activating factor of this **antifreeze protein**; 2) the ability to track the cellular and secretory patterns of T_m 12.86 immunologically; 3) the use of an *in vitro* fat body cell culture system for direct investigation of cellular events. and, 4) a means of quantifying RI behavior of purified T_m 12.86, and samples of unknown concentrations of THPs, to provide a more sensitive detection method for **antifreeze activity** at scaled down values associated with the *in vitro* system. In combination, these studies indicate that the adaptation mechanisms contributing to the overall **antifreeze protein** response in a **cold hardy** insect involves a complex interaction between **antifreeze proteins** and endogenous activators of these **proteins**. With the availability of these key tools, the details of a precise and seasonal regulation of these **antifreeze protein** /activator interactions, which ultimately generate an efficient **cold hardy** response, now have the potential to be worked out.
 CC Ecology: environmental biology - Bioclimatology and biometeorology 07504
 Ecology: environmental biology - Animal 07508
 External effects - Temperature as a primary variable - cold 10616
 Metabolism - Proteins, peptides and amino acids 13012
 Temperature - Thermotherapy 23005
 Invertebrata: comparative, experimental morphology, physiology and pathology - Insecta: physiology 64076
 IT Major Concepts
 Climatology (Environmental Sciences); Ecology (Environmental Sciences); Metabolism; Pathology; Physiology
 IT Miscellaneous Descriptors
 ADAPTATION MECHANISM; ANTIFREEZE ACTIVITY; BIOCHEMISTRY AND BIOPHYSICS; BIOSYNTHESIS; COLD HARDINESS; RECRYSTALLIZATION INHIBITION; THERMAL HYSTERESIS; THERMAL HYSTERESIS PROTEIN
 ORGN Classifier
 Insecta 75300
 Super Taxa
 Arthropoda; Invertebrata; Animalia
 Organism Name
 insect
 Insecta
 Taxa Notes
 Animals, Arthropods, Insects, Invertebrates
 L108 ANSWER 3 OF 11 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN
 AN 1994:359565 BIOSIS
 DN PREV199497372565
 TI Characterization of primary cell cultures derived from fat body of the beetle, *Tenebrio molitor*, and the immunolocalization of a **thermal**

hysteresis protein in vitro.

AU Easton, Christopher M.; Horwath, Kathleen L. [Reprint author]

CS Dep. Biol. Sci., Binghamton Univ., Binghamton, NY 13902-6000, USA

SO Journal of Insect Physiology, (1994) Vol. 40, No. 6, pp. 537-547.

CODEN: JIPHAF. ISSN: 0022-1910.

DT Article

LA English

ED Entered STN: 23 Aug 1994
Last Updated on STN: 24 Aug 1994

AB A cell culture system was developed for *Tenebrio molitor* fat body to investigate the regulation of **thermal hysteresis protein** (THP) production. To establish the reliability of this system we compared the histology and THP distribution of cultured fat body cells to the features of intact tissue. Cell cultures established from fat body contained three major cell types: globular, stellate and rounded cells. Globular cells resembled mature trophocytes of *in vivo* fat body. They contained large lipid vesicles, **protein** granules, and extensive glycogen stores. Stellate and rounded cells lacked **protein** granules, and contained varying amounts of lipids and glycogen. THPs were localized in the cytoplasm of cultured cells, associated with **protein**-containing granules in globular cells, or within discrete vesicles in the other cell types. In intact fat body, THPs were primarily localized to the accumulated **protein** granules. These results are the first to suggest that there is intracellular storage of THPs in the fat body. Such storage provides the potential for later mobilization during periods of low temperature and/or desiccation. Furthermore, our fat body primary cultures morphologically and functionally resemble their *in vivo* counterparts and will be useful in addressing questions about the regulation of THP synthesis and secretion by insect fat body.

CC Cytology - Animal 02506
Ecology: environmental biology - Bioclimatology and biometeorology 07504
Biochemistry studies - Proteins, peptides and amino acids 10064
Biochemistry studies - Lipids 10066
Biochemistry studies - Carbohydrates 10068
Metabolism - Proteins, peptides and amino acids 13012
Bones, joints, fasciae, connective and adipose tissue - Physiology and biochemistry 18004
Immunology - General and methods 34502
Invertebrata: comparative, experimental morphology, physiology and pathology - Insecta: physiology 64076
Invertebrate body regions - Special organs 64218

IT Major Concepts
Cell Biology; Climatology (Environmental Sciences); Immune System (Chemical Coordination and Homeostasis); Metabolism; Physiology; Skeletal System (Movement and Support)

IT Chemicals & Biochemicals
GLYCOGEN

IT Miscellaneous Descriptors
GLYCOGEN; LIPID; OVERWINTERING ADAPTATION; PROTEIN SYNTHESIS; TROPHOCYTE

ORGN Classifier
Coleoptera 75304
Super Taxa
Insecta; Arthropoda; Invertebrata; Animalia

Organism Name
Tenebrio molitor

Taxa Notes
Animals; Arthropods, Insects, Invertebrates

RN 9005-79-2 (GLYCOGEN)

DN PREV198987038331; BA87:38331
 TI STAGE AND SEGMENT SPECIFICITY OF THE SECRETORY CELL OF THE DERMAL GLANDS
 OF THE TOBACCO HORNWORM *MANDUCA-SEXTA*.
 AU HORWATH K L [Reprint author]; RIDDIFORD L M
 CS DEP BIOLOGICAL SCI, STATE UNIV NEW YORK, BINGHAMTON, NY 13901, USA
 SO Developmental Biology, (1988) Vol. 130, No. 1, pp. 365-373.
 CODEN: DEBIAO. ISSN: 0012-1606.
 DT Article
 FS BA
 LA ENGLISH
 ED Entered STN: 23 Jan 1989
 Last Updated on STN: 23 Jan 1989
 AB The pair of epidermally derived Verson's glands on each segment of the tobacco hornworm, *Manduca sexta*, secretes at ecdysis **proteinaceous** products which coat the epicuticle. These **proteins** are produced by a single secretory cell which displays both stage- and segment-specificity during development. Three major 12-kDa **polypeptides** are synthesized at the larval molts, while higher molecular weight (14-93 kDa) **polypeptides** are produced at the pupal molt. In the pupa, but not in the larva, there are three segment-specific **protein** patterns, each involving both qualitative and quantitative differences: (1) thoracic (T) segments 1 and 2; (2) T3 and abdominal (A) segment 1; (3) A2-A8. Larval-specific **proteins** were found to be synthesized in low amounts throughout the penultimate fourth instar, with enhanced synthesis occurring during the molt, coincident with the molting surge of ecdysteroids. Synthesis of the major pupal products commenced about the time of wandering, with enhanced synthesis occurring throughout prepupal development, coincident with the prepupal surge in ecdysteroids. The onset of synthesis of the major pupal products differed, both within and between segments. Culture of fifth instar Day 2 glands in vitro showed that this synthesis depended on 20-hydroxyecdysone. The differential regulation within and between segments observed in vivo was also seen in vitro.
 CC Cytology - Animal 02506
 Genetics - Animal 03506
 Biochemistry studies - Sterols and steroids 10067
 Metabolism - Proteins, peptides and amino acids 13012
 Endocrine - Neuroendocrinology 17020
 Integumentary system - Physiology and biochemistry 18504
 Development and Embryology - Morphogenesis 25508
 In vitro cellular and subcellular studies 32600
 Invertebrata: comparative, experimental morphology, physiology and pathology - Insecta: physiology 64076
 Invertebrate body regions - Hard parts 64214
 IT Major Concepts
 Cell Biology; Development; Endocrine System (Chemical Coordination and Homeostasis); Genetics; Integumentary System (Chemical Coordination and Homeostasis); Metabolism; Physiology
 IT Miscellaneous Descriptors
 DEVELOPMENT 20 HYDROXYECDYSONE ECDYSIS DIFFERENTIAL REGULATION
 PROTEIN SECRETION EPICUTICLE IN-VITRO TISSUE CULTURE
 ORGN Classifier
 Lepidoptera 75330
 Super Taxa
 Insecta; Arthropoda; Invertebrata; Animalia
 Taxa Notes
 Animals, Arthropods, Insects, Invertebrates
 RN 5289-74-7 (20-HYDROXYECDYSONE)
 L108 ANSWER 5 OF 11 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN
 AN 1986:455506 BIOSIS
 DN PREV198682112348; BA82:112348
 TI THERMOPERIODIC INVOLVEMENT IN ANTIFREEZE

PROTEIN PRODUCTION IN THE COLD HARDY BEETLE
 DENDROIDES-CANADENSIS IMPLICATIONS FOR PHOTOPERIODIC TIME MEASUREMENT.

AU HORWATH K L [Reprint author]; DUMAN J G
 CS DEP ZOOL, NJ-15, UNIV WASH, SEATTLE, WASH 98195, USA
 SO Journal of Insect Physiology, (1986) Vol. 32, No. 9, pp. 799-806.
 CODEN: JIPHAF. ISSN: 0022-1910.

DT Article
 FS BA
 LA ENGLISH
 ED Entered STN: 21 Nov 1986
 Last Updated on STN: 21 Nov 1986

AB This study considers a possible role for **thermoperiods** (i.e. the duration of **thermophase** (T) and **cryophase** (C) during a 24-h period) in the regulation of **antifreeze protein** production in *Dendroides canadensis*. Larvae were exposed to **thermocycles** consisting of long (16 h) and short (8 h) **thermophases** in the form T/C, 25°/17° C, while maintained in a background of either constant darkness, or constant light. Short-day **thermoperiods** stimulated, while long-day **thermoperiods** prevented, **antifreeze protein** production under both aperiodic lighting conditions. If the **cryophase** temperature was allowed to reach 13° C (T/C, 25°/13°), significant differences ($P < 0.001$) between long and short-day **thermoperiodic** responses persisted in both constant light and constant darkness, while the overall levels of **antifreeze protein** production increased under constant light conditions independent of the **thermoperiod**. Studies incorporating conflicting photothermal regimes in the form short photoperiod with a long **thermoperiod**, and vice versa, triggered intermediate **antifreeze protein** activity. These results indicate that *D. canadensis* are capable of distinguishing long from short-day **thermoperiods**, over the cycling temperature from 25 to 13° C, and will initiate **antifreeze protein** production under the appropriate conditions. Furthermore, the expression of this **thermoperiodic** response under both constant darkness and constant light holds important implications for photoperiodic time measurement in this species by suggesting that the circadian clock involved with daylength measurement is of an internal coincidence type. The observed interaction of the light-cycle and **thermocycle** in the regulation of **antifreeze protein** production is discussed from the perspective of entrainment of the *D. canadensis* circadian system.

CC Circadian rhythms and other periodic cycles 07200
 External effects - Light and darkness 10604
 External effects - Temperature as a primary variable 10614
 Metabolism - Proteins, peptides and amino acids 13012
 Temperature - Thermorhythms 23008
 Invertebrata: comparative, experimental morphology, physiology and pathology - Insecta: physiology 64076

IT Major Concepts
 Biosynchronization; Metabolism; Physiology

IT Miscellaneous Descriptors
 CIRCADIAN RHYTHM

ORGN Classifier
 Hymenoptera 75326
 Super Taxa
 Insecta; Arthropoda; Invertebrata; Animalia
 Taxa Notes
 Animals, Arthropods, Insects, Invertebrates

TI FURTHER STUDIES ON THE INVOLVEMENT OF THE CIRCADIAN SYSTEM IN
 PHOTOPERIODIC CONTROL OF ANTIFREEZE PROTEIN PRODUCTION
 IN THE BEETLE DENDROIDES-CANADENSIS.
 AU HORWATH K L [Reprint author]; DUMAN J G
 CS DEP BIOLOGY, UNIV NOTRE DAME, NOTRE DAME, IN 46556, USA
 SO Journal of Insect Physiology, (1984) Vol. 30, No. 12, pp. 947-956.
 CODEN: JIPHAF. ISSN: 0022-1910.
 DT Article
 FS BA
 LA ENGLISH
 AB The role of circadian rhythmicity in the photoperiodic time measuring processes regulating antifreeze protein production in *D. canadensis* was further investigated. Using "T" experiments larvae were exposed to environmental light cycle periods close to the period length of the endogenous circadian oscillator. The following light cycles were employed: light/dark 8/13, 8/14, 8/16, 8/18 and 8/19 corresponding to period lengths of 21, 22, 24, 26 and 27 h. Larvae maintained in cycles \leq 24 h displayed a characteristic short-day response, showing significantly ($P < 0.01$) greater antifreeze protein activity than did those measured on the day of collection in late summer. In contrast, a long-day response was observed in larvae maintained under a 26- or 27-h light cycle in that antifreeze protein activity did not differ from that measured on the initial collection date. The role of photoperiod and temperature in influencing the photoperiodic timing processes were examined with a series of resonance experiments. The 1st group consisted of a 24, 36, 48, 60 or 72-h light cycle, each with an 8-h photophase at temperatures of 20° or 17° C. Rhythmic increases in antifreeze protein levels at intervals of 24 h occurred under both temperatures. The lower temperature displaced the resonance curve in the vertical direction (i.e., increasing % population response) and reduced the difference between peaks and troughs on the resonance curve. Resonance experiments incorporating a 14-h photophase resulted in low antifreeze protein activity under all conditions except a 36-h light cycle in which a 67% induction was observed. Eight hour resonance experiments were conducted with *D. canadensis* collected in early spring to determine whether the circadian system participates in the photoperiodic timing processes influencing the spring termination of antifreeze protein production. Positive resonance results were obtained in that only larvae maintained in cycles of 36 and 60 h displayed significantly ($P < 0.01$) lower antifreeze activity when compared to animals on the initial collection date. The combined results emphasize the involvement of the circadian system in the photoperiodic control of antifreeze protein production by *D. canadensis* during the fall and spring. The induction of antifreeze protein production is a function of photoperiod. Temperature appears to modify the photoperiodic response in some manner involving the photoperiodic time measuring processes. The photoperiodic response of antifreeze protein production by *D. canadensis* is dependent upon the entrainment of the circadian system by the light cycle.
 CC Circadian rhythms and other periodic cycles 07200
 Ecology: environmental biology - Bioclimatology and biometeorology 07504
 Biochemistry studies - Proteins, peptides and amino acids 10064
 External effects - Light and darkness 10604
 External effects - Temperature as a primary variable - cold 10616
 Metabolism - Proteins, peptides and amino acids 13012
 Blood - Blood and lymph studies 15002
 Temperature - Thermorhythms 23008
 Temperature - Thermoadaptation 23010
 Temperature - Thermoregulation 23012
 Development and Embryology - General and descriptive 25502
 Invertebrates: comparative, experimental morphology, physiology and pathology - Insecta: physiology 64076

IT Major Concepts

Biosynchronization; Blood and Lymphatics (Transport and Circulation);
 Climatology (Environmental Sciences); Metabolism; Physiology

IT Miscellaneous Descriptors

ENTRAINMENT

ORGN Classifier

Coleoptera 75304

Super Taxa

Insecta; Arthropoda; Invertebrata; Animalia

Taxa Notes

Animals, Arthropods, Insects, Invertebrates

L108 ANSWER 7 OF 11 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN

AN 1984:275323 BIOSIS

DN PREV198478011803; BA78:11803

TI YEARLY VARIATIONS IN THE OVER WINTERING MECHANISMS OF THE COLD HARDY BEETLE DENDROIDES-CANADENSIS.

AU HORWATH K L [Reprint author]; DUMAN J G

CS DEP NEUROBIOL PHYSIOL, HOGAN HALL, NORTHWESTERN UNIV, EVANSTON, ILL 60201, USA

SO Physiological Zoology, (1984) Vol. 57, No. 1, pp. 40-45.
 CODEN: PHZOAA. ISSN: 0031-935X.

DT Article

FS BA

LA ENGLISH

AB Successful overwintering by insects is dependent primarily on 1 of 2 modes of adaptation; the ability to survive **freezing** (**freezing** tolerance) and the ability to avoid **freezing** by supercooling (**freezing** susceptibility). Studies on the larvae of the beetle *D. canadensis* from northern Indiana [USA] during the 1977-1978 and 1978-1979 winters revealed that this species was **freeze** tolerant, exhibiting supercooling points (SCP) between -8.0° to -12.0° C with lethal temperatures (LLT) of -28.0° C. *D. canadensis* has switched from a **freeze**-tolerant to a **freeze**-susceptible mechanism of overwintering. During the winter of 1981-1982, larvae exhibited extensive supercooling (averaging .apprx. -26.0° C). The LLT corresponded to their SCP temperatures; therefore, they could not tolerate **freezing** at that time. Evidence accumulated during 1979-1980 and 1980-1981 suggests that the switch in overwintering adaptations occurred between these winters. The only notable change in the **cold**-hardening parameters of *D. canadensis* throughout this time involves the apparent loss of ice nucleating **proteins**.

Regardless of the overwintering strategy employed, LLT are similar from year to year. This is the 1st known instance where the overwintering stage of a species has been observed to display both types of adaptations.

CC Ecology: environmental biology - Bioclimatology and biometeorology 07504

Ecology: environmental biology - Animal 07508

Biochemistry studies - Proteins, peptides and amino acids 10064

External effects - Temperature as a primary variable - cold 10616

Temperature - Thermoadaptation 23010

Development and Embryology - Experimental 25504

Development and Embryology - Morphogenesis 25508

Invertebrata: comparative, experimental morphology, physiology and pathology - Insecta: physiology 64076

IT Major Concepts

Development; Ecology (Environmental Sciences); Physiology

IT Miscellaneous Descriptors

LARVA THERMAL ADAPTATION FREEZING TOLERANCE

FREEZING SUSCEPTIBILITY ICE NUCLEATING PROTEIN

INDIANA USA/

ORGN Classifier

Coleoptera 75304

Super Taxa

Insecta; Arthropoda; Invertebrata; Animalia
Taxa Notes
Animals, Arthropods, Insects, Invertebrates

L108 ANSWER 8 OF 11 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN
 AN 1984:251083 BIOSIS
 DN PREV198477084067; BA77:84067
 TI PHOTOPERIODIC AND THERMAL REGULATION OF ANTIFREEZE
 PROTEIN LEVELS IN THE BEETLE DENDROIDES-CANADENSIS.
 AU HORWATH K [Reprint author]; DUMAN J G
 CS DEP NEUROBIOL PHYSIOL, HOGAN HALL, NORTHWEST UNIV, EVANSTON, IL 602/1, USA
 SO Journal of Insect Physiology, (1983) Vol. 29, No. 12, pp. 907-918.
 CODEN: JIPHAF. ISSN: 0022-1910.
 DT Article
 FS BA
 LA ENGLISH
 AB The importance of photoperiod, temperature and their interaction in controlling the seasonal pattern of hemolymph **antifreeze protein** levels in larvae of *D. canadensis* was investigated. A complete photoperiodic response curve for **antifreeze protein** production was generated at 20° C with larvae collected in early fall. Individuals exposed to a 10-h photoperiod or less, including constant darkness, had significantly elevated **antifreeze** levels over those maintained in an 11-h photoperiod or more, including constant light. The critical daylength resulting in 50% population response lies between LD [L = light, D = dark] 11:13 and LD 10:14. This photoperiodic response was masked at sufficiently low (threshold between 15° and 10° C) and high (threshold between 25° and 30° C) temperatures. Partial photoperiodic response curves (at 17° and 25° C) obtained within this specified temperature range indicate that the position of the critical photoperiod (between 10 and 11 h) is stable while the amplitude of the response curve is temperature dependent. Experiments investigating the mechanisms controlling the spring depletion of **protein antifreeze** levels suggest that both photoperiod and temperature are important. The dominant response of photoperiod in the fall along with the modifying effects of temperature are considered to provide the necessary precision to assure **cold** tolerance early in the fall and the flexibility to protect the species from yearly variation in weather conditions.
 CC Ecology: environmental biology - Bioclimatology and biometeorology 07504
 Biochemistry studies - Proteins, peptides and amino acids 10064
 External effects - Light and darkness 10604
 External effects - Temperature as a primary variable - cold 10616
 Metabolism - Proteins, peptides and amino acids 13012
 Blood - Blood and lymph studies 15002
 Temperature - Cryobiology 23004
 Temperature - Thermoadaptation 23010
 Development and Embryology - General and descriptive 25502
 Invertebrata: comparative, experimental morphology, physiology and pathology - Insecta: physiology 64076
 IT Major Concepts
 Blood and Lymphatics (Transport and Circulation); Metabolism;
 Physiology
 IT Miscellaneous Descriptors
 HEMOLYMPH
 ORGN Classifier
 Coleoptera 75304
 Super Taxa
 Insecta; Arthropoda; Invertebrata; Animalia
 Taxa Notes
 Animals, Arthropods, Insects, Invertebrates

L108 ANSWER 9 OF 11 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN
 AN 1984:194972 BIOSIS
 DN PREV198477027956; BA77:27956
 TI INDUCTION OF ANTIFREEZE PROTEIN PRODUCTION BY JUVENILE HORMONE IN LARVAE OF THE BEETLE DENDROIDES-CANADENSIS.
 AU HORWATH K L [Reprint author]; DUMAN J G
 CS DEP BIOL, UNIV NOTRE DAME, NOTRE DAME, INDIANA 46556, USA
 SO Journal of Comparative Physiology B Biochemical Systemic and Environmental Physiology, (1983) Vol. 151, No. 2, pp. 233-240.
 CODEN: JPBPD. ISSN: 0174-1578.

DT Article

FS BA

LA ENGLISH

AB Larvae of the beetle *D. canadensis* accumulate **protein antifreezes** during the winter. *D. canadensis* which were collected in the early fall, prior to the initiation of **cold hardening** processes, were treated with either 3.3 or 6.6 µg juvenile hormone I topically in acetone and maintained for 21 days under normally non-inductive acclimation conditions (16 light/8 dark, 20° C). Hormone treated animals significantly elevated the levels of **antifreeze protein** in their hemolymph compared to those of acetone treated and untreated controls or animals measured on the day of collection. *D. canadensis* treated with the anti-JH compound precocene II (P2) in acetone for 24 h at a concentration of 20 µg/cm² (a dose below LD₅₀ for behavioral survival) and then maintained under acclimation conditions conducive to **antifreeze protein** production (8 light/16 dark, 20° C) for 2 wk failed to elevate levels of **antifreeze**. Acetone treated control animals accumulated a significant concentration of **antifreeze protein**. *D. canadensis* were also treated with 20 and 150 µg/cm² P2 (a dose below the LD₅₀ for gross survival) followed by acclimation to short (8 h) photoperiod at 10° C. All animals receiving the higher P2 dosage failed to elevate **antifreezes**, while only 42.9% of the individuals treated with the lower dosage initiated **antifreeze protein** production. In contrast, > 80% of untreated and 70% of acetone treated controls responded to these inductive acclimation conditions by elevating **antifreeze** concentrations. Evidently, juvenile hormone participates in the seasonal control of **antifreeze protein** production in *D. canadensis*. Since this species does not enter a diapause state prior to or throughout the winter this is the 1st evidence establishing a direct hormonal mechanism involved with insect **cold hardiness**.

CC Circadian rhythms and other periodic cycles 07200
 Ecology: environmental biology - Animal 07508
 Biochemistry studies - Proteins, peptides and amino acids 10064
 Biochemistry studies - Lipids 10066
 External effects - Temperature as a primary variable - cold 10616
 Pathology - Necrosis 12510
 Metabolism - Proteins, peptides and amino acids 13012
 Endocrine - Neuroendocrinology 17020
 Nervous system - Physiology and biochemistry 20504
 Temperature - General measurement and methods 23001
 Temperature - Cryobiology 23004
 Temperature - Hypothermia and hyperthermia 23006
 Temperature - Thermoadaptation 23010
 Development and Embryology - General and descriptive 25502
 Invertebrata: comparative, experimental morphology, physiology and pathology - Insecta: physiology 64076

IT Major Concepts
 Development; Endocrine System (Chemical Coordination and Homeostasis); Metabolism; Nervous System (Neural Coordination); Physiology

IT Miscellaneous Descriptors
 DIAPAUSE

ORGN Classifier

Coleoptera 75304

Super Taxa

Insecta; Arthropoda; Invertebrata; Animalia

Taxa Notes

Animals, Arthropods, Insects, Invertebrates

L108 ANSWER 10 OF 11 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN
AN 1984:194971 BIOSIS

DN PREV198477027955; BA77:27955

TI PREPARATORY ADAPTATIONS FOR WINTER SURVIVAL IN THE COLD HARDY
BEETLES DENDROIDES-CANADENSIS AND DENDROIDES-CONCOLOR.

AU HORWATH K L [Reprint author]; DUMAN J G

CS DEP BIOL, UNIV NOTRE DAME, NOTRE DAME, INDIANA 46556, USA

SO Journal of Comparative Physiology B Biochemical Systemic and Environmental
Physiology, (1983) Vol. 151, No. 2, pp. 225-232.
CODEN: JPBPD. ISSN: 0174-1578.

DT Article

FS BA

LA ENGLISH

AB Thermal hysteresis (indicative of macromolecular antifreeze levels) was measured in hemolymph samples from the beetle, *D. canadensis*, after acclimation to a short (8 h) photoperiod at 20° C, or long (16 h) photoperiod at temperatures of 10° and 20° C. Both the short photoperiod and low temperature (10° C) treatment caused a significant elevation of thermal hysteresis, thereby implicating increased antifreeze protein production. Oxygen consumption rates of animals in each acclimation treatment were measured and no significant differences in metabolic rates were noted between treatments when measured at a high (20° C) temperature. Conditions which initiate antifreeze protein production fail to induce a diapause condition, characterized by a drop in metabolic rates. Natural populations sampled in mid-winter possess elevated levels of thermal hysteresis, and accumulate glycerol and sorbitol, but do not show a depressed metabolic rate. *D. canadensis* do not enter a diapause during the winter, but are fully capable of achieving a high level of cold hardiness through the accumulation of antifreeze proteins and polyhydroxy alcohols. The possibility that *D. canadensis* exhibited metabolic compensation under any acclimation treatment was examined and the results indicated that acclimation to a long photoperiod or low temperature did not affect O₂ consumption rates. In contrast, *D. canadensis* acclimated to a short photoperiod at 20° C displayed considerable metabolic rate adjustments, as indicated by a Q₁₀ of 1.36. *D. concolor*, a known congener of *D. canadensis*, also displayed metabolic rate elevation at low temperatures following acclimation to a short photoperiod. For both species, the photoperiodically induced metabolic compensation was effected through a rotation in the metabolism-temperature curve. Evidently, in the absence of a diapause, *D. canadensis* and *D. concolor* display metabolic rate compensation in response to seasonally changing photoperiods.

CC Mathematical biology and statistical methods 04500

Circadian rhythms and other periodic cycles 07200

Ecology: environmental biology - Bioclimatology and biometeorology 07504

Ecology: environmental biology - Animal 07508

Biochemistry studies - General 10060

Biochemistry studies - Proteins, peptides and amino acids 10064

Biophysics - Biocybernetics 10515

External effects - Light and darkness 10604

External effects - Temperature as a primary variable - cold 10616

Metabolism - Energy and respiratory metabolism 13003

Metabolism - Proteins, peptides and amino acids 13012

Temperature - General measurement and methods 23001

Temperature - Cryobiology 23004
 Temperature - Hypothermia and hyperthermia 23006
 Temperature - Thermorhythms 23008
 Temperature - Thermoadaptation 23010
 Invertebrata: comparative, experimental morphology, physiology and
 pathology - Insecta: physiology 64076
 IT Major Concepts
 Biosynchronization; Metabolism; Physiology
 IT Miscellaneous Descriptors
 ANTIFREEZE PROTEIN POLY HYDROXY ALCOHOL GLYCEROL
 HYSTERESIS PHOTOPERIOD
 ORGN Classifier
 Coleoptera 75304
 Super Taxa
 Insecta; Arthropoda; Invertebrata; Animalia
 Taxa Notes
 Animals, Arthropods, Insects, Invertebrates
 RN 56-81-5 (GLYCEROL)

 L108 ANSWER 11 OF 11 BIOSIS COPYRIGHT 2004 BIOLOGICAL ABSTRACTS INC. on STN
 AN 1982:245410 BIOSIS
 DN PREV198274017890; BA74:17890
 TI INVOLVEMENT OF THE CIRCADIAN SYSTEM IN PHOTOPERIODIC REGULATION OF INSECT
 ANTIFREEZE PROTEINS.
 AU HORWATH K L [Reprint author]; DUMAN J G
 CS DEP OF BIOLOGY, UNIV OF NOTRE DAME, NOTRE DAME, INDIANA 46556, USA
 SO Journal of Experimental Zoology, (1982) Vol. 219, No. 2, pp. 267-270.
 CODEN: JEZOAO. ISSN: 0022-104X.
 DT Article
 FS BA
 LA ENGLISH
 AB Several species of insects produce **proteins** in the winter that
 depress the hemolymph **freezing** and supercooling points, thereby
 functioning as **antifreezes**. These **proteins** produce a
 thermal hysteresis (difference between the **freezing** and
 melting points). This study concerns the environmental and physiological
 mechanisms that regulate the seasonal production of **antifreeze**
 proteins in the beetle, *Dendroides canadensis*. Larvae collected
 in early fall from a natural population and acclimated to a short
 photoperiod (8L/16D [light/dark] at 20° C, 90% relative humidity)
 elevated levels of **thermal hysteresis proteins** (THP);
 those individuals maintained on a long (16L/8D) photoperiod did not.
 Resonance experiments showed that circadian rhythmicity is involved in the
 photoperiodic timing mechanism used by *Dendroides* to control
 antifreeze production. An important aspect of insect seasonality,
 i.e., winter hardening, includes complex biological timing processes of
 circadian nature.
 CC Circadian rhythms and other periodic cycles 07200
 Ecology: environmental biology - Bioclimatology and biometeorology 07504
 Biochemistry studies - Proteins, peptides and amino acids 10064
 External effects - Light and darkness 10604
 External effects - Temperature as a primary variable - cold 10616
 External effects - Humidity 10620
 Metabolism - Proteins, peptides and amino acids 13012
 Blood - Blood and lymph studies 15002
 Temperature - General measurement and methods 23001
 Temperature - Thermoadaptation 23010
 Development and Embryology - Experimental 25504
 Development and Embryology - Morphogenesis 25508
 Invertebrata: comparative, experimental morphology, physiology and
 pathology - Insecta: physiology 64076
 IT Major Concepts
 Biosynchronization; Blood and Lymphatics (Transport and Circulation);

Development; Metabolism; Physiology

IT Miscellaneous Descriptors

DENDROIDES-CANADENSIS LARVA HEMOLYMPH ACCLIMATION THERMAL
HYSTERESIS PROTEIN WINTER HARDENING SEASONALITY

ORGN Classifier

Insecta 75300

Super Taxa

Arthropoda; Invertebrata; Animalia

Taxa Notes

Animals, Arthropods, Insects, Invertebrates

ORGN Classifier

Coleoptera 75304

Super Taxa

Insecta; Arthropoda; Invertebrata; Animalia

Taxa Notes

Animals, Arthropods, Insects, Invertebrates

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FILE 'HCAPLUS' ENTERED AT 09:46:16 ON 04 AUG 2004

L1 1 S (US20020173024 OR US20020172951)/PN OR (WO2001-US18532 OR US2
E HORWATH K/AU
L2 14 S E3-E6
E EASTON C/AU
L3 15 S E3,E14,E17
L4 26 S L2,L3
L5 197 S THERMAL (L) HYSTERESIS (L) ?PROTEIN?
L6 41 S THERMAL (L) HYSTERESIS (L) ?PEPTIDE?
L7 1071 S ANTIFREEZ? (L) ?PROTEIN?
L8 332 S ANTIFREEZ? (L) ?PEPTIDE?
E THP
L9 5105 S E3
E AFP
L10 3573 S E3
L11 30 S L9 AND THERMAL (L) HYSTERESIS
L12 350 S L10 AND ANTIFREEZ?
L13 1177 S L5-L8,L11,L12
E HYSTERESIS/CT
E E3+ALL
L14 272 S E1 (L) THERMAL
L15 31 S L14 AND (?PROTEIN? OR ?PEPTIDE?)
L16 1177 S L13,L15
E ANTIFREEZE/CT
E E5+ALL
L17 667 S E2
L18 1177 S L16,L17
E ANTIFREEZE/CT
E E3+ALL
L19 22 S E2,E3 (L) PROTEIN
L20 7 S E2,E3 (L) PEPTIDE
L21 11 S E2,E3 (L) ?PEPTIDE?
L22 41 S E2,E3 (L) ?PROTEIN?
L23 1177 S L18-L22
E RECRYSTALLIZATION/CT
E E3+ALL
L24 17276 S E5
E E4+ALL
L25 76344 S E4
L26 17 S L23 AND L24

L27 21 S L23 AND L25
 L28 370 S L23 AND ?CRYST?
 L29 73 S L23 AND ?RECRYST?
 L30 88 S L26, L27, L29
 L31 119 S L23 AND ?CRYO?
 E CRYOPRESERVATION/CT
 E E3+ALL
 L32 27 S L23 AND E2
 L33 66 S L23 AND (E3+OLD, NT, PFT, RT OR E4+OLD, NT, PFT, RT)
 E ICE/CT
 L34 4 S E5 AND L23
 E E3+ALL
 L35 132 S L23 AND E3, E2+OLD, NT, PFT
 L36 223 S L23 AND (E8+OLD, NT, PFT, RT OR E9+OLD, NT, PFT, RT OR E10+OLD, NT, P
 E FREEZING POINT/CT
 L37 118 S L23 AND (E3+OLD, NT, PFT, RT OR E4+OLD, NT, PFT, RT)
 E PRESERVATION/CT
 E E3+ALL
 L38 55 S L23 AND E1+NT
 L39 280 S L23 AND (E17+OLD, NT, PFT, RT OR E16+OLD, NT, PFT, RT OR E15+OLD, NT
 L40 441 S L30-L39 AND (?PROTEIN? OR ?PEPTIDE?)
 L41 9 S L30-L39 AND (PROTEIN? OR PEPTIDE?)/SC, SX
 L42 441 S L40, L41
 L43 141 S L42 AND SOLUTION
 L44 10 S L4 AND L23
 L45 10 S L4 AND L5-L23
 L46 11 S L4 AND (?FREEZ? OR ?FROZ? OR ?CRYO? OR ?CRYST?)
 L47 11 S L1, L44-L46
 L48 10 S L47 AND (?PROTEIN? OR ?PEPTIDE?)
 L49 1 S L47 AND (PROTEIN? OR PEPTIDE?)/SC, SX
 L50 10 S L48, L49
 L51 1 S L47 NOT L50
 E TENEBRIOS/CT
 L52 926 S E4+OLD, NT, PFT, RT
 L53 1091 S E3+OLD, NT, PFT, RT
 L54 1092 S E3-E7
 E E3+ALL
 E E6+ALL
 L55 3162 S E6+NT
 L56 32 S L23 AND L52-L55
 L57 42 S L23 AND (TENEBRION? OR T MOLITOR OR TENEBRI? MOLITOR)
 L58 12 S L42 AND L56, L57
 L59 4 S L43 AND L50, L58
 L60 21 S L1, L50, L58, L59
 L61 29 S L56, L57 NOT L60
 L62 476 S L42, L43, L60, L61
 L63 476 S L62 AND L1-L62
 L64 349 S L63 AND (PD<=20000608 OR PRD<=20000608 OR AD<=20000608)
 L65 349 S L64 AND (?PROTEIN? OR ?PEPTIDE?)
 L66 6 S L64 AND (PROTEIN? OR PEPTIDE?)/SC, SX
 L67 109 S L65, L66 AND SOLUTION
 L68 106 S L67 AND (ANTIFREEZ? OR RECRYSTAL?)
 L69 48 S L68 AND (INHIBIT? OR PROTECT?)
 L70 79 S L67 AND (PROTEIN# OR PEPTIDE# OR POLYPEPTIDE# OR GLYCOPEPTIDE
 L71 37 S L69 AND L70
 SEL DN AN 14 26 35
 L72 34 S L71 NOT E1-E9
 L73 42 S L70 NOT L71
 L74 30 S L73 AND ANTIFREEZE PROTEIN
 L75 12 S L73 NOT L74
 SEL DN AN 1 2 3 5
 L76 8 S L75 NOT E10-E21
 L77 11 S L69 NOT L70-L76

SEL DN AN 1
L78 10 S L77 NOT E22-E24
L79 19 S L67,L68 NOT L69-L78
SEL DN AN 13 17
L80 17 S L79 NOT E25-E30
L81 75 S L1,L50,L74,L76,L78,L80
L82 75 S L81 AND L1-L81
L83 75 S L82 AND (AFP? OR AFGP? OR THP? OR ANTIFREEZ? OR ANTI FREEZ? O
L84 45 S L82 AND ?CRYST?
L85 75 S L82 AND (HYPOTHER? OR ?PRESERV? OR ?PROTECT? OR INHIBIT? OR P
L86 75 S L82-L85
L87 38 S L56,L57 NOT L86
L88 24 S L87 AND (PD<=20000608 OR PRD<=20000608 OR AD<=20000608)
L89 0 S L87 AND L4
L90 99 S L86,L88
L91 14 S L87 NOT L90

FILE 'HCAPLUS' ENTERED AT 10:34:01 ON 04 AUG 2004

FILE 'BIOSIS' ENTERED AT 10:34:34 ON 04 AUG 2004
E HORWATH K/AU

L92 29 S E3-E7
E EASTON C/AU
L93 17 S E3,E6,E15,E18
L94 42 S L92,L93
SEL DN AN 1 5 7 11 15 16 17 21 28 30 32 33 34 35 36 37 38 39 40
L95 19 S L94 AND E1-E53
L96 19 S L94 AND (?FREEZ? OR ?FROZ? OR COLD OR THERM?)
L97 19 S L95,L96
L98 28 S L94 AND INSECTA+NT/ORGN
L99 18 S L97 AND L98
L100 10 S L98,L98 NOT L99
L101 17 S L97 AND (?PROTEIN? OR ?PEPTIDE?)
L102 18 S L98 AND (?PROTEIN? OR ?PEPTIDE?)
L103 18 S L101,L102 AND L98
L104 24 S L94-L102 NOT L103
SEL DN AN 1
L105 1 S L104 AND E54-E55
L106 19 S L103,L105
L107 8 S L106 NOT ARTICLE/DT
L108 11 S L106 NOT L107

FILE 'BIOSIS' ENTERED AT 10:41:49 ON 04 AUG 2004

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